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30 JUNE 1955

ELECTRICAL TIMES

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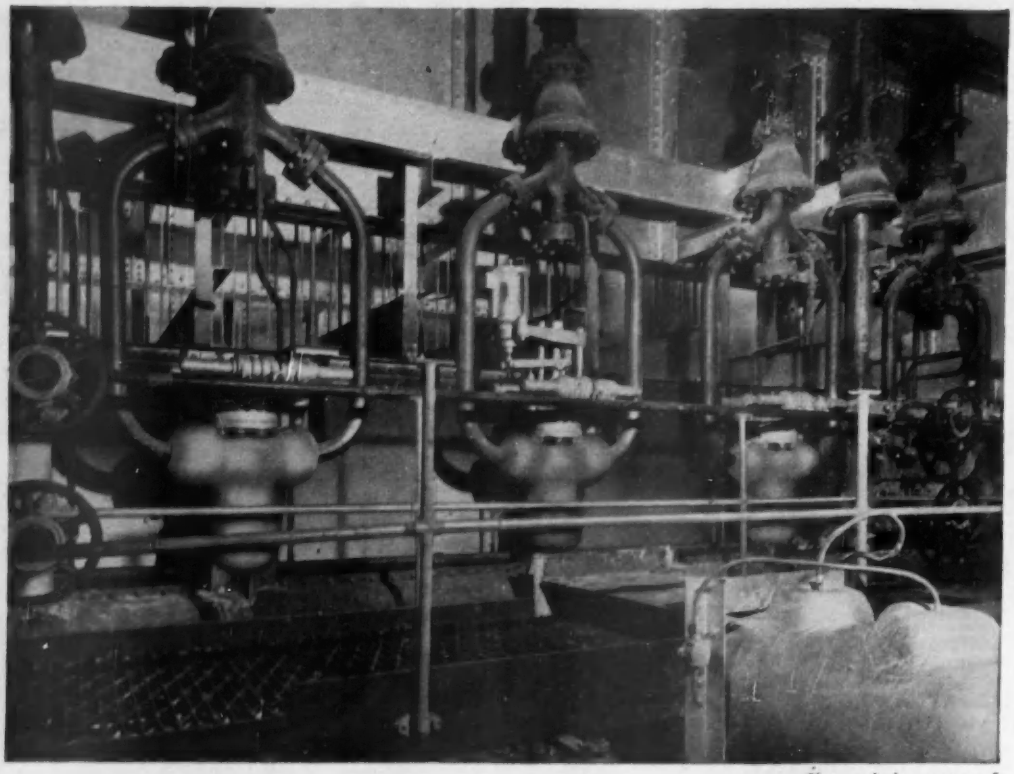

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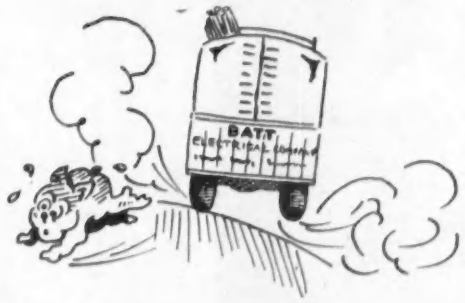

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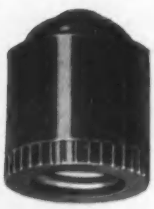
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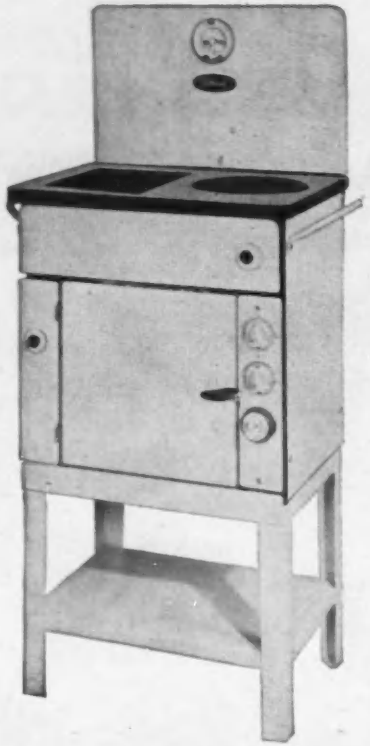

53 PLUS

Auto-oven Timer switches on and off automatically. Built-in 4-hour ringing timer. Thermostatic oven control. 8" boiling plate, grill-boiler. Interlocking device enables cooker to be operated on 13A circuit.

PRICE: **£28.10.0**

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Auto-oven Timer switches on and off automatically. Built-in 4-hour ringing timer. Floodlit hob, useful 3" shelf. Thermostatic oven with inner glass door. 8" plate with Simmerstat, 6¼" plate, 10¼" x 8" grill-boiler. Utensil drawer 24/- extra. 13A plug and socket.

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64 PLUS

Auto-oven Timer switches on and off automatically. Built-in 4-hour timer and independent 1-hour ringing timer. Floodlit hob and oven. Thermostatic oven with inner glass door. Useful 3" shelf. 8", 6¼" plates, 10¼" x 8" grill-boiler with Simmerstats. 13A plug and socket.

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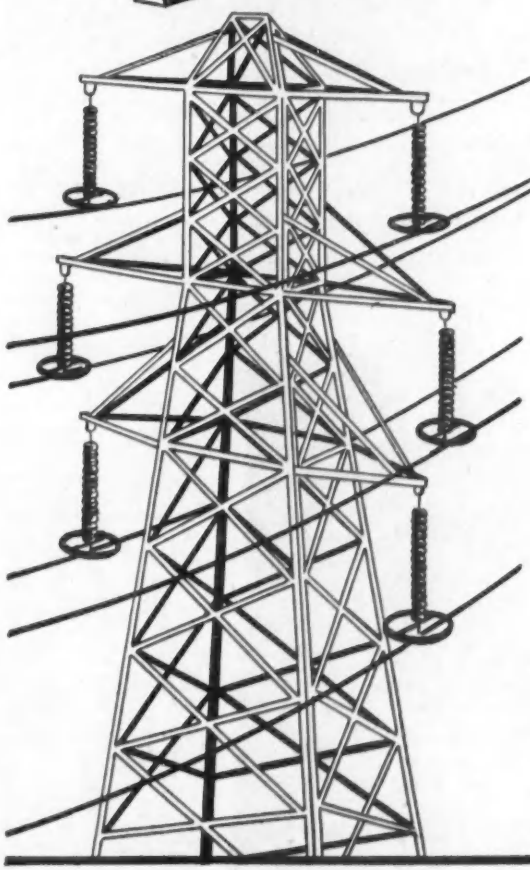

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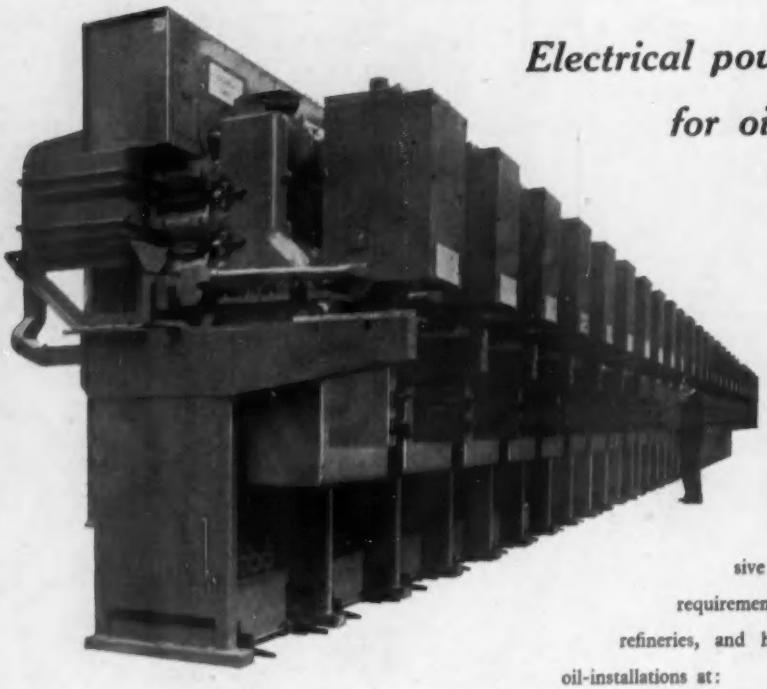

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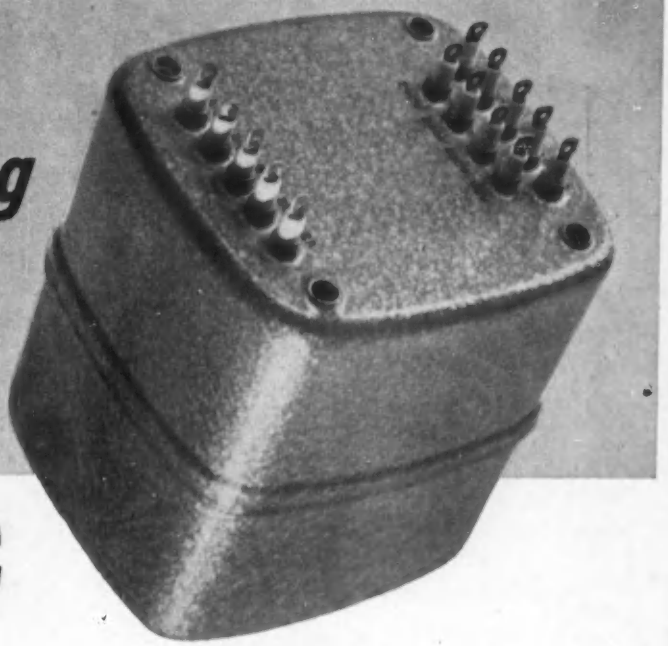

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Transformer manufactured by Associated Electronic Engineers Ltd.

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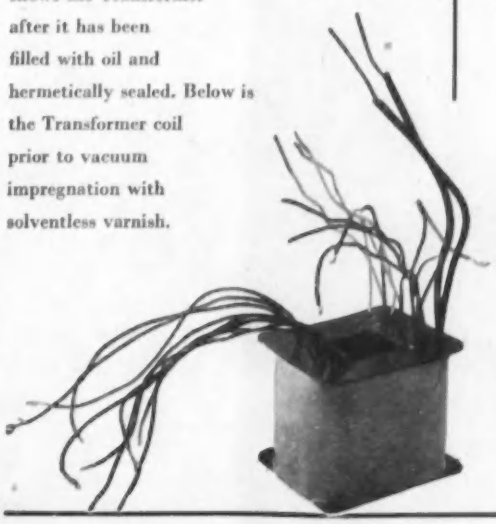
The illustration above shows the Transformer after it has been filled with oil and hermetically sealed. Below is the Transformer coil prior to vacuum impregnation with solventless varnish.



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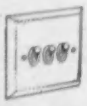 TUMBLER SWITCHES

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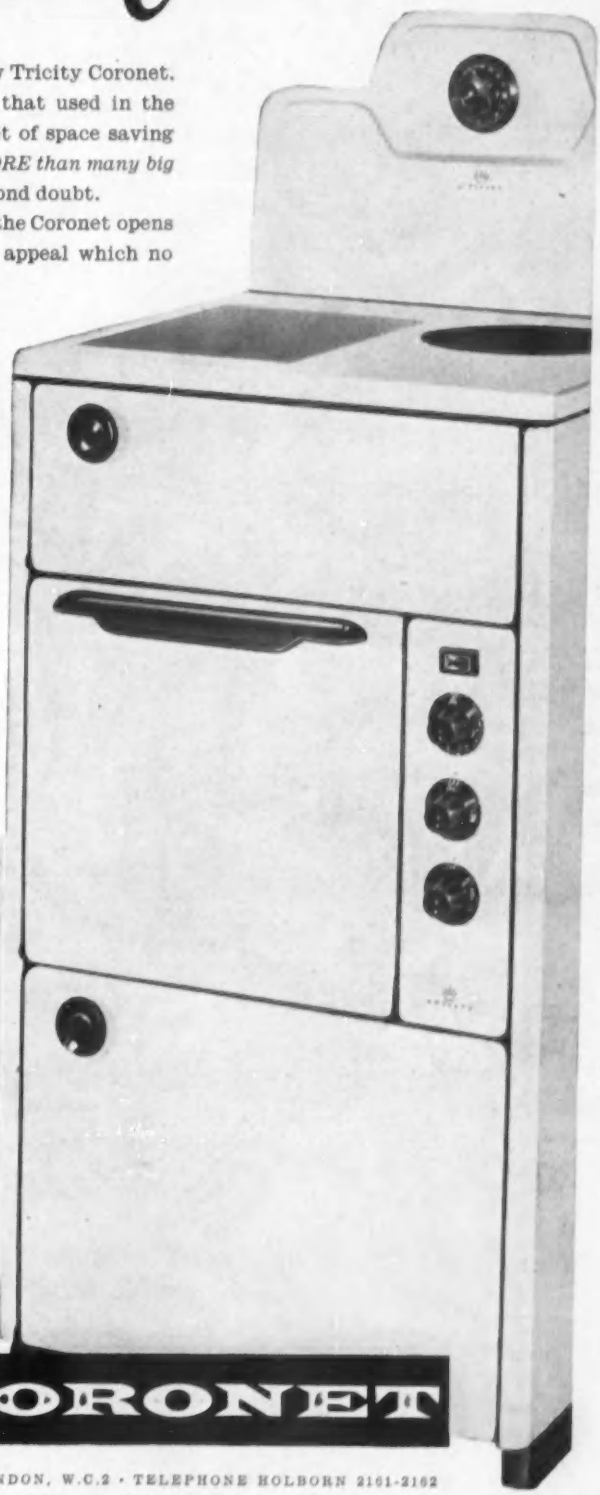
Look at the price again and consider the big market the Coronet opens up to time controlled cookers. Think of its unique appeal which no housewife can resist. The demand is big already and will continue to grow. Order now and be sure of quick and steady sales.



* TIME SWITCH CONTROL

* UNIQUE SPACE-SAVING OVENWARE

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2 one doz. Patty Tins
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One heat resisting oven glove.

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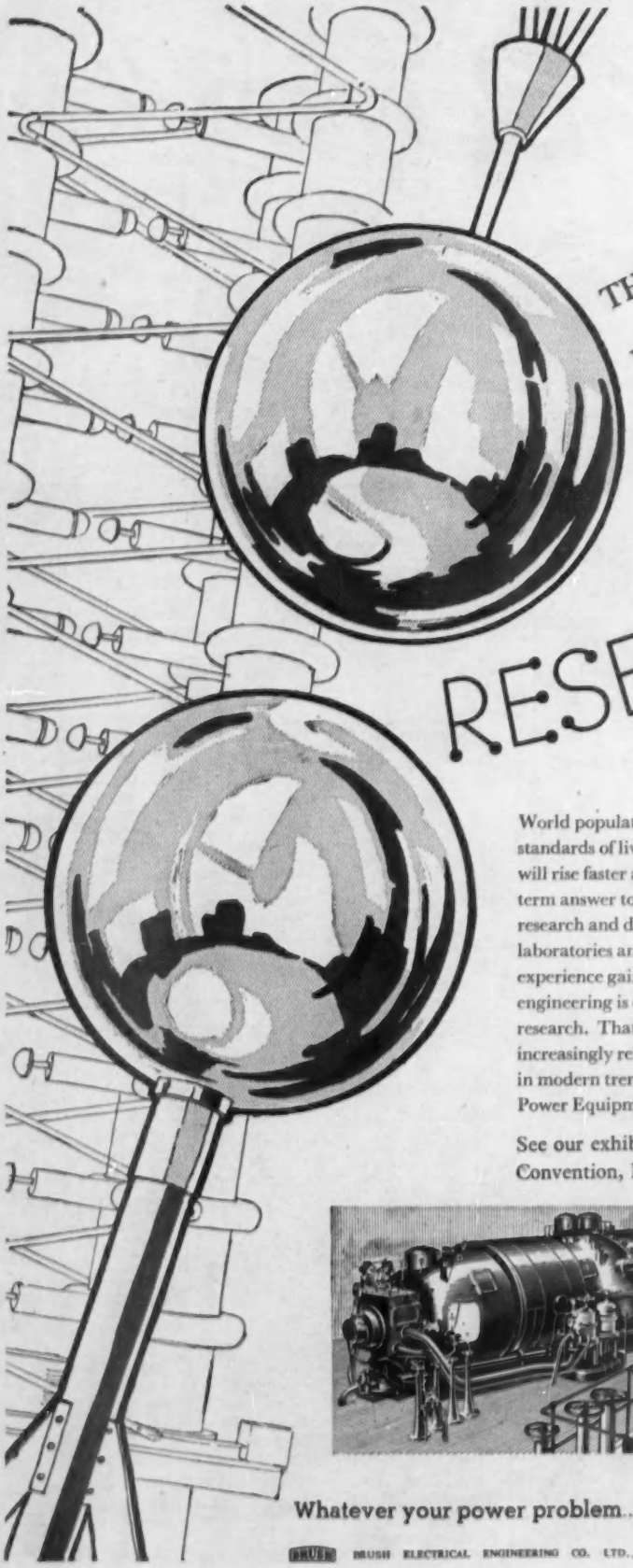

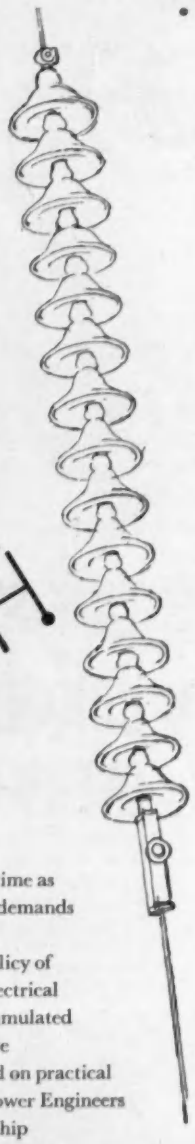

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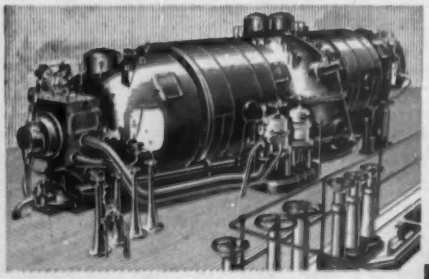

A 'Brush' Ljungstrom Turbo-alternator Set—12,500 kW installed at Hunts Bay Power Station, Jamaica.

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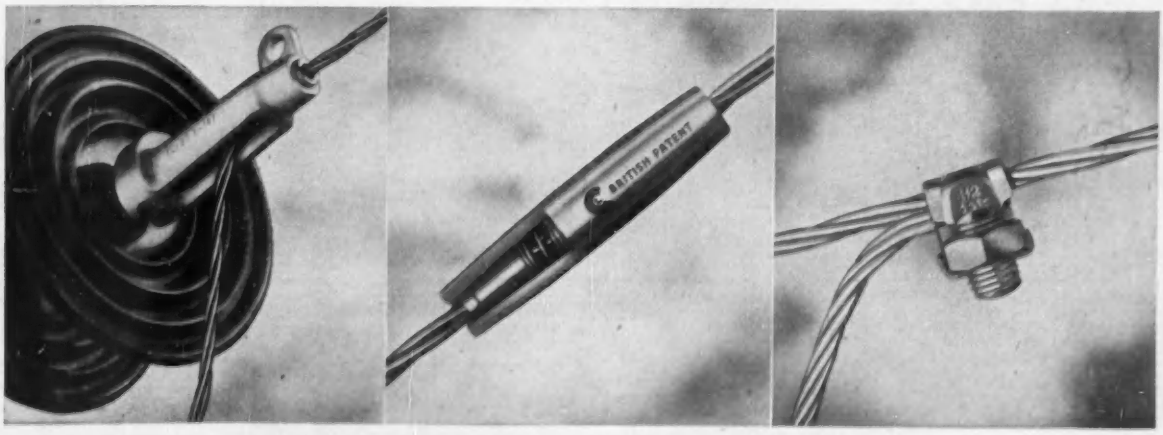

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this is the

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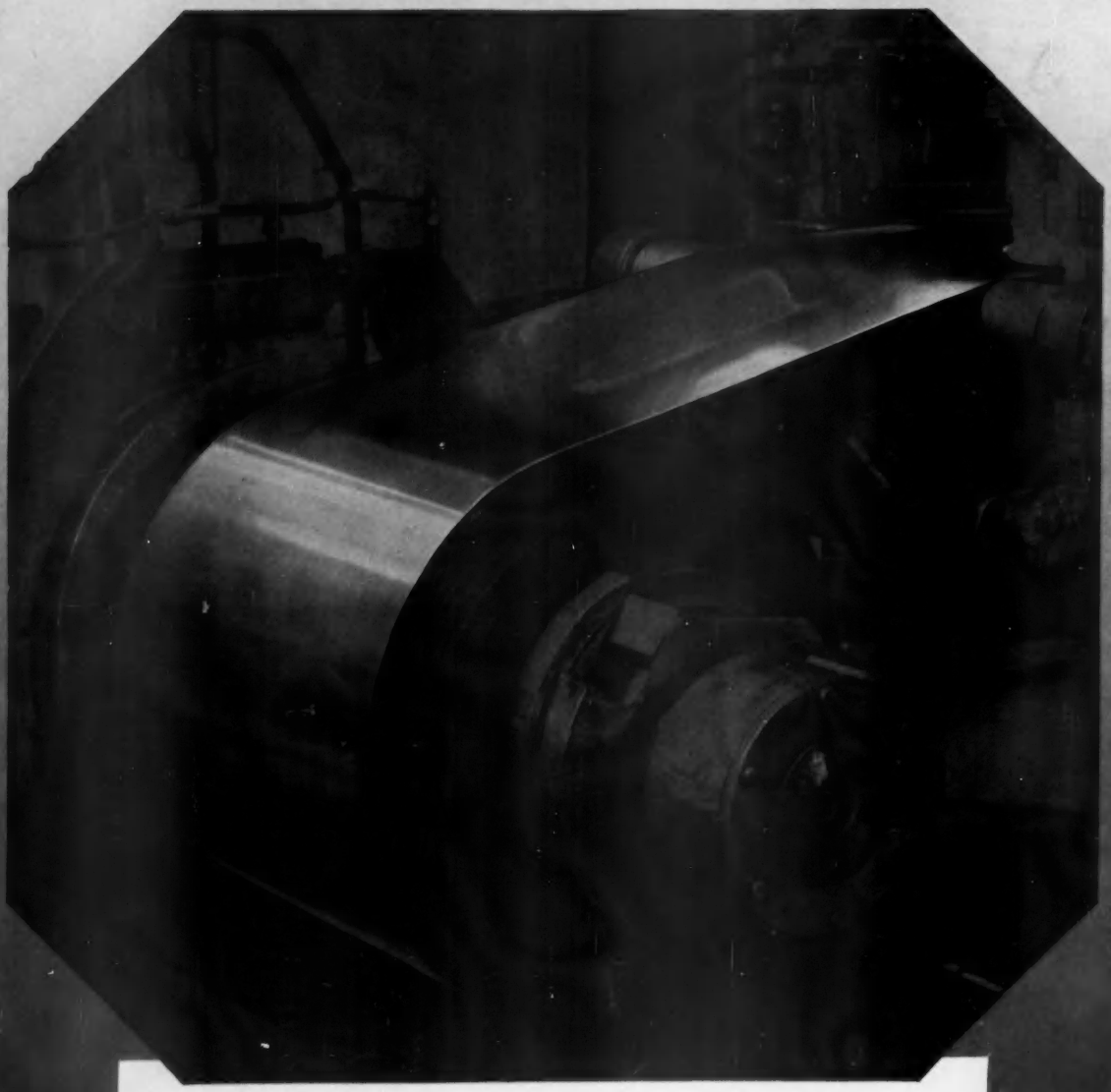

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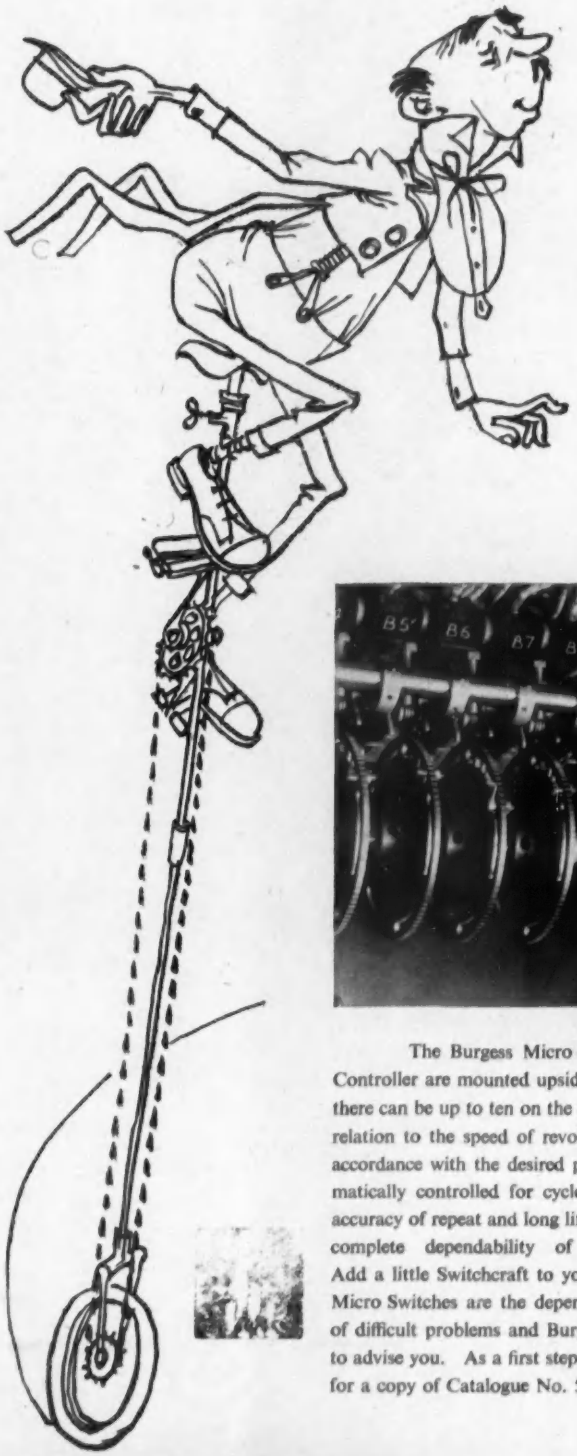

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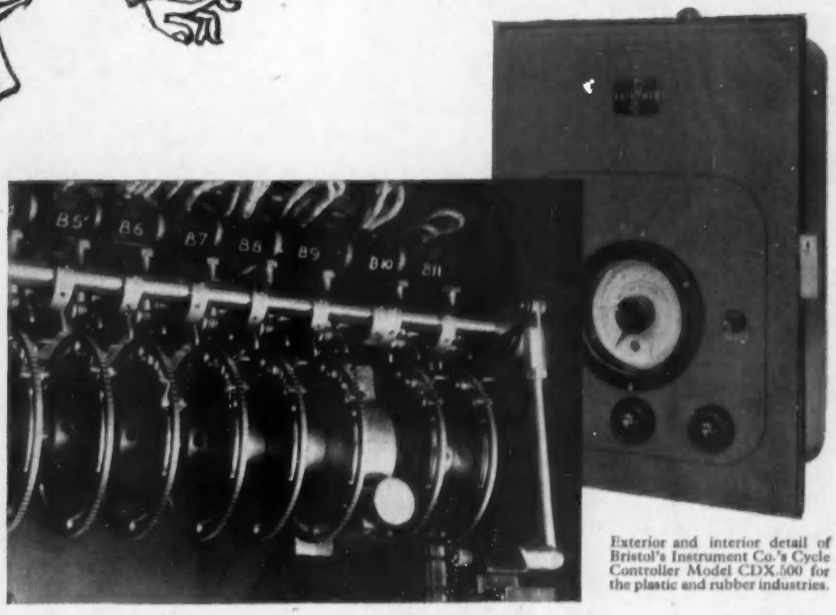

Exterior and interior detail of Bristol's Instrument Co.'s Cycle Controller Model CDX.500 for the plastic and rubber industries.

The Burgess Micro Switches seen in the above photograph of Bristol's Cycle Controller are mounted upside down and are operated by dogs locked to cams of which there can be up to ten on the camshaft. The actuating devices are most carefully timed in relation to the speed of revolution of the camshaft to operate each switch precisely in accordance with the desired programme. In this manner up to ten processes are automatically controlled for cycle durations ranging from 20 seconds to 5 minutes. The accuracy of repeat and long life of the Burgess Micro Switches are factors upon which the complete dependability of the instrument relies.

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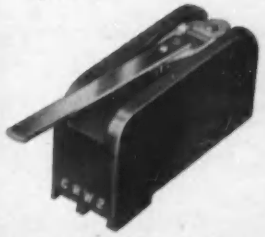

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Part No.				647		648		649	650		651		652
Ohmic value ...	5	10	25	50	100	250	500	1,000	2,500	5,000	10,000	25,000	50,000
Current (amps.)	1	.7	.45	.32	.22	.14	.1	.07	.045	.032	.022	.014	.01

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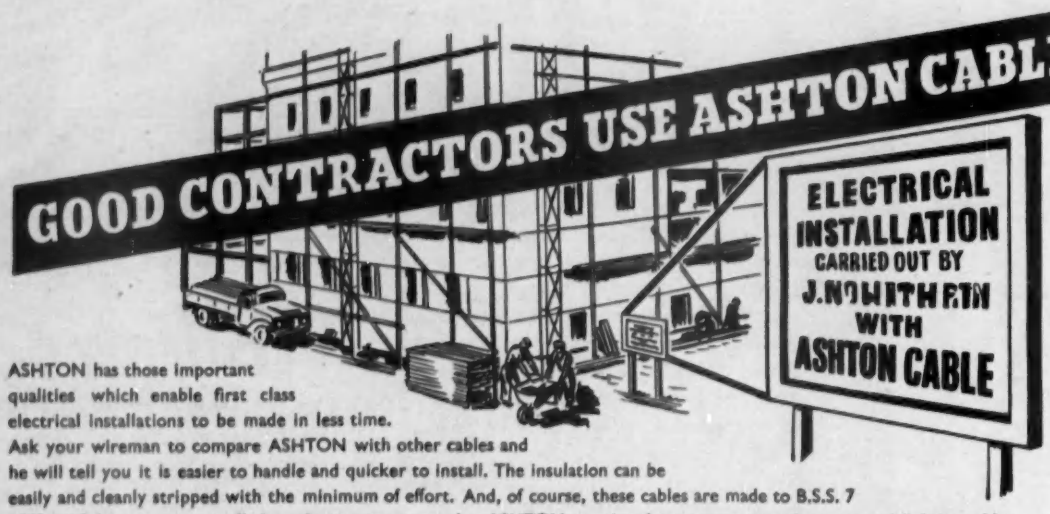
GOOD CONTRACTORS USE ASHTON CABLES



ASHTON has those important qualities which enable first class electrical installations to be made in less time. Ask your wireman to compare ASHTON with other cables and he will tell you it is easier to handle and quicker to install. The insulation can be easily and cleanly stripped with the minimum of effort. And, of course, these cables are made to B.S.S. 7 1953, with laboratory controlled production to ensure that ASHTON remains the supreme name in power and lighting cables.

use and specify Ashton
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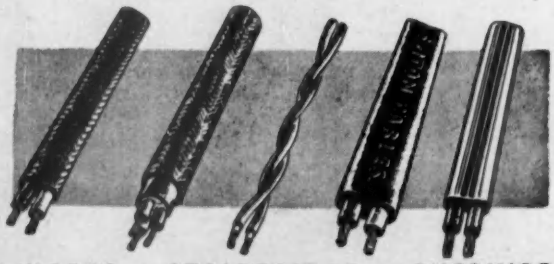

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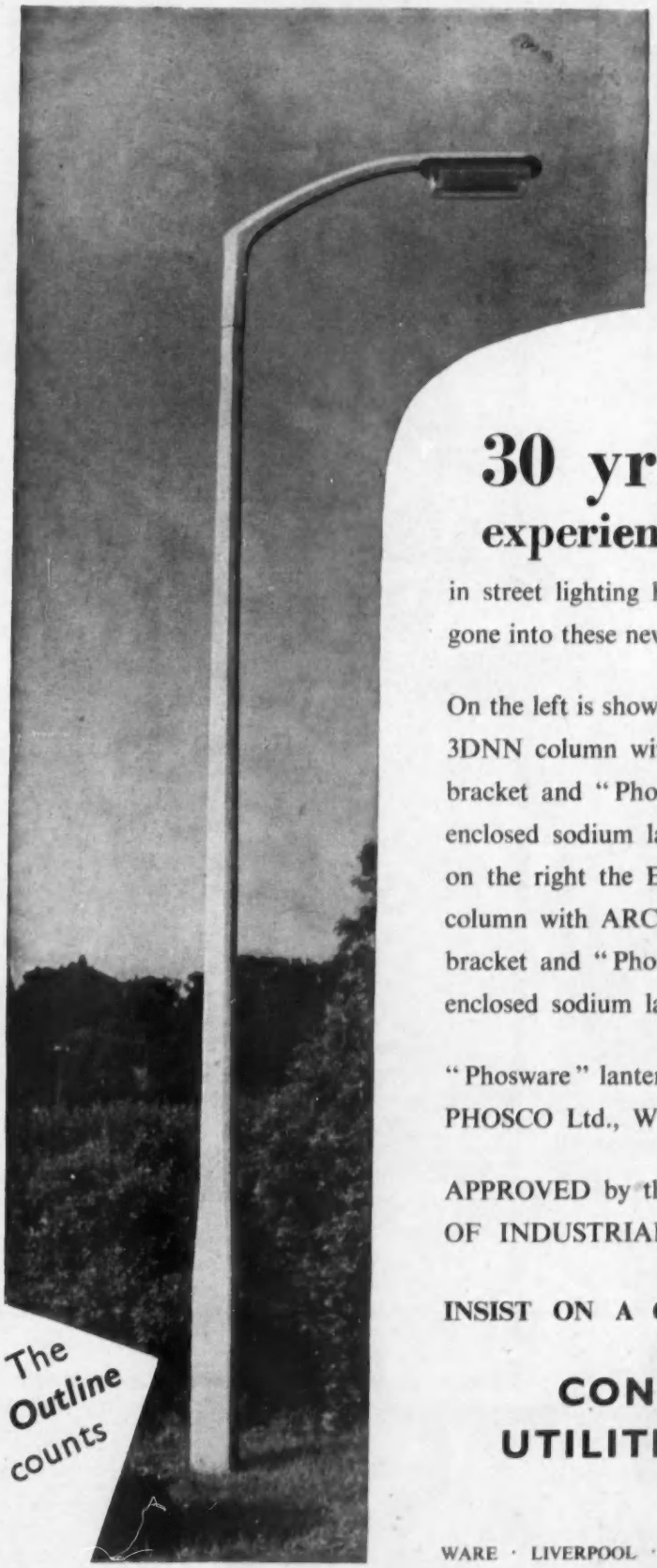
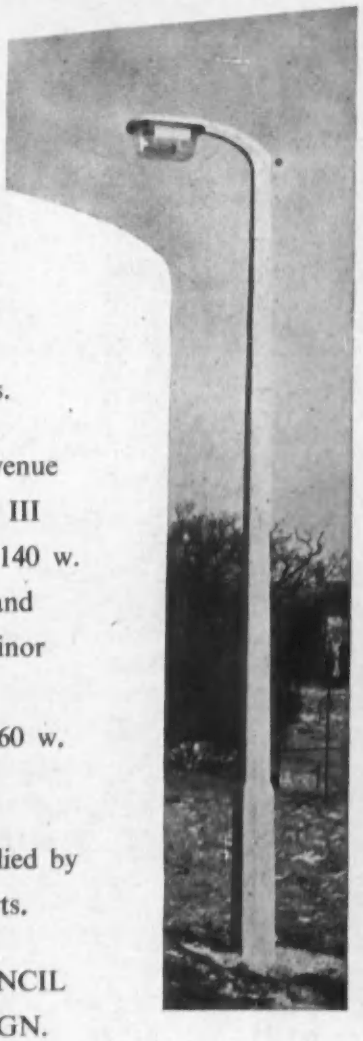


DESIGNED TO MATCH!



30 yrs. experience

in street lighting has gone into these new designs.

On the left is shown the Avenue 3DNN column with ARC III bracket and "Phosware" 140 w. enclosed sodium lantern, and on the right the Estate Minor column with ARC III bracket and "Phosware" 60 w. enclosed sodium lantern.

"Phosware" lanterns supplied by PHOSCO Ltd., Ware, Herts.

APPROVED by the COUNCIL OF INDUSTRIAL DESIGN.

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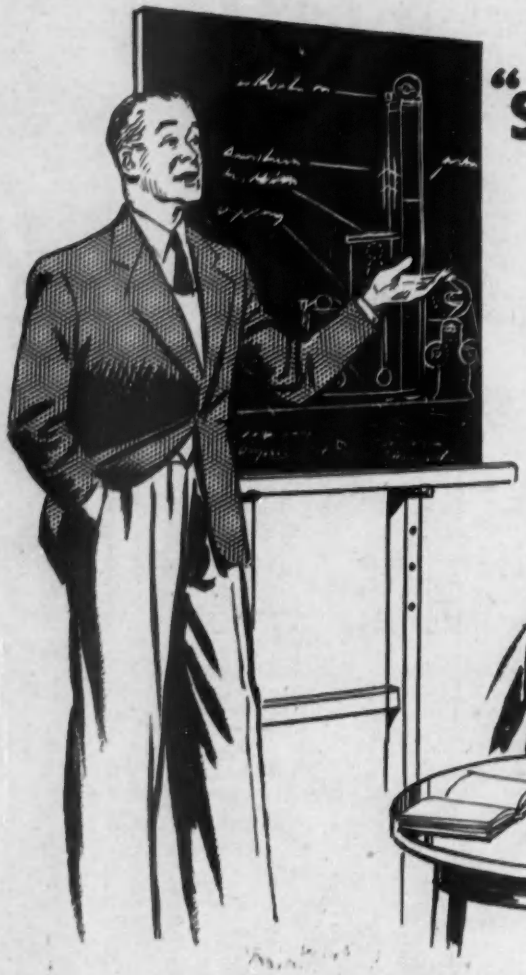

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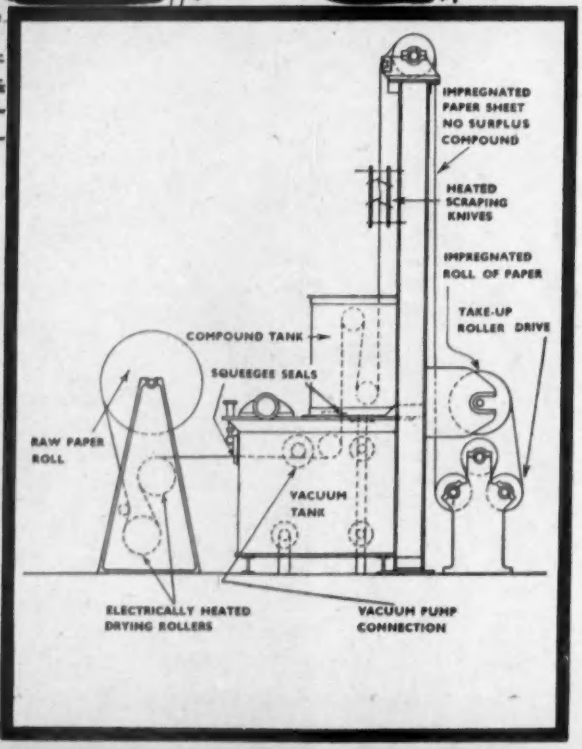
But has it occurred to you that Glovers pre-impregnated paper insulated cables are **INHERENTLY NON-DRAINING** and can be installed in any position, with the assurance that compound migration is eliminated.



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we don't want to be big headed about it-

—but we feel sure you will forgive us for claiming, in all due modesty, to be well *ahead* of all competitors in the production of Immersion Heaters.

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He depends on Power by

The Production Engineer likes Howells motors firstly, because of their intrinsic qualities of fitness for purpose and secondly, because of the personal service and interest afforded by six strategically placed branch offices.

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WITH THE * SPEEDHEAT OVEN
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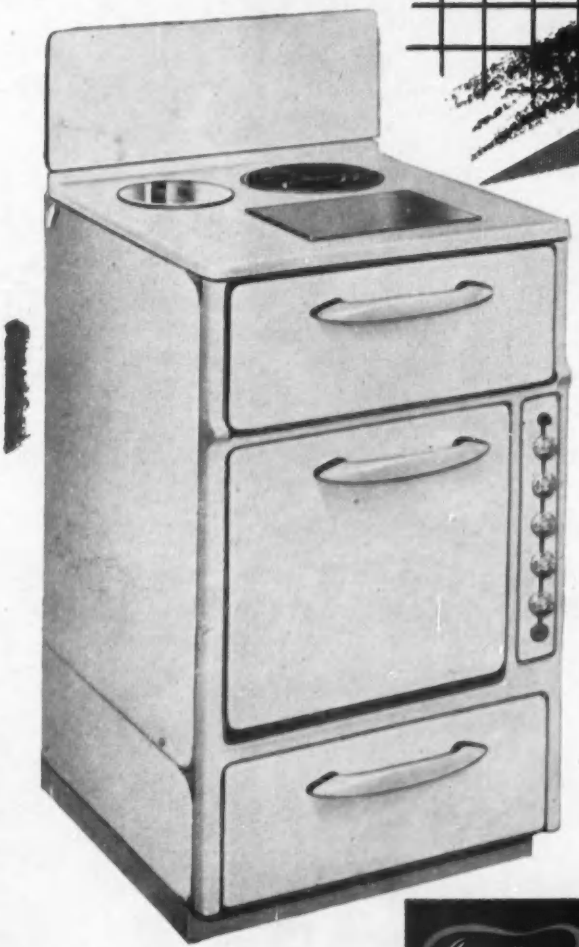

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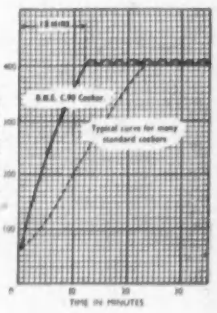
THE OVEN CHART

This is an outstanding performance, which is a convincing selling point and is simple to explain. Add to it B.N.E. solid quality construction and refinements at no extra cost, and you have quicker and easier selling too!



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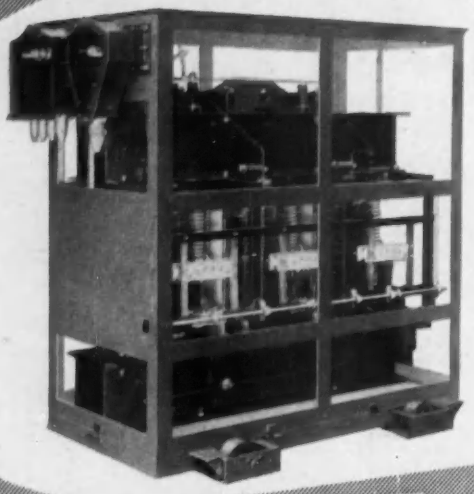

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The insulating properties of Fibreglass are already widely applied in the electrical industry. Fibreglass is also combined with silicone compounds : chemical hybrids which possess much of the heat stability, inertness and electrical non-conductivity of glass-fibre. The result is Class H insulation, the basis of the revolutionary new dry type transformers.

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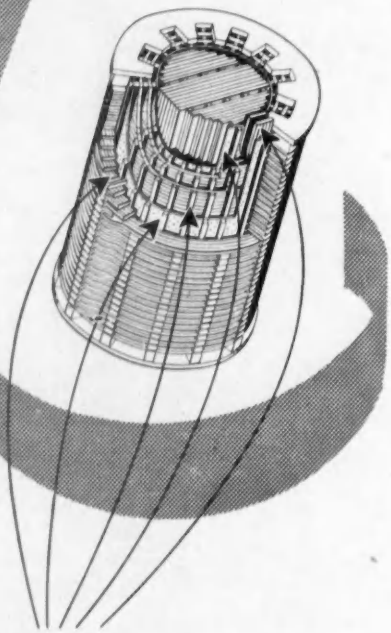

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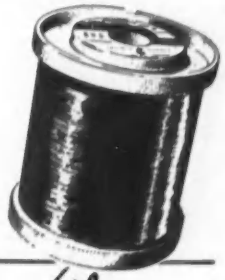
We shall be pleased to mail you one or more sets, if you will kindly write us on your business letterheading.



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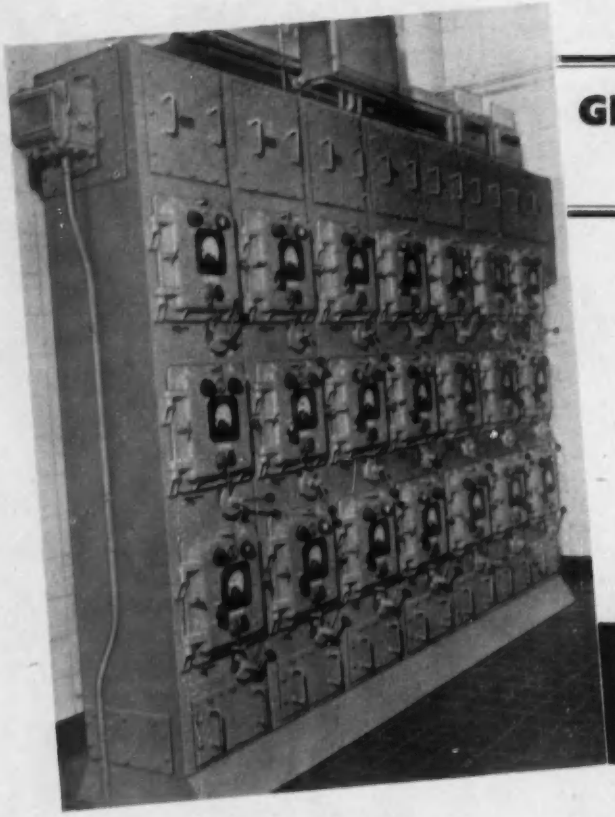

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FOR GAS WORKS SERVICE

Illustrated is a Hot Gas Cleaning and Water Softening Plant 21-motor switchboard, installed at the Swan Village works of the West Midlands Gas Board.

All are of heavy dustproof construction, arranged for centralised control of groups of motors with sequence interlocking when required.

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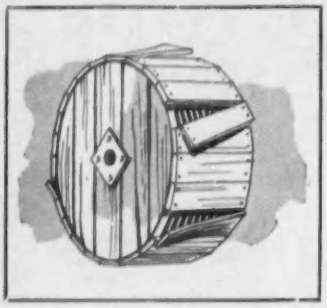

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Hitherto, the usual practice has been to use wooden drums for anything over reel or bobbin sizes. This has meant bulky, heavy drums with serious disadvantages in handling, storing and freight, as well as rapid, costly deterioration despite high maintenance expenditure.

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TYPICAL 11kV 250 MVA IVI SWITCHBOARD

embodying arc trapped circuit breakers for important industrial substation

B.E.P. Convention, Brighton
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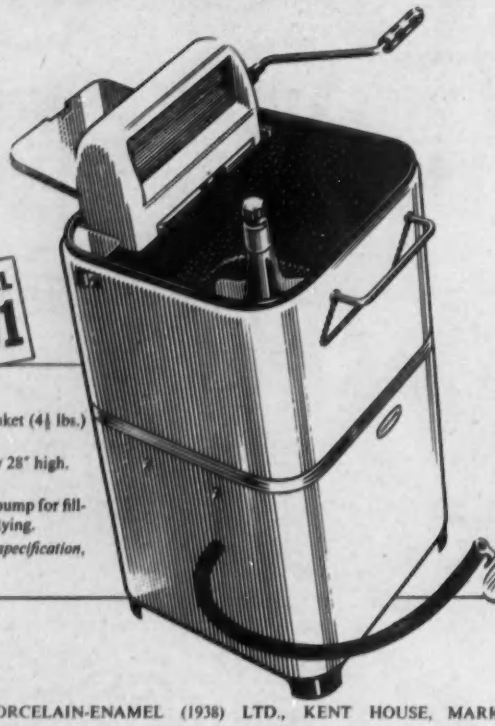

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Dimensions—
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Six 6 MVA Unit Transformers, 11.8/3.45 KV.

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Cradle (solid or resilient), resilient base with or without auto-belt tension, endshield, or ring.

Single-phase	*$\frac{1}{8}$ to 1 h.p. up to 250 volts, 25 to 100 cycles.*
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Many sizes can be supplied from stock.

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THE BRITISH THOMSON-HOUSTON CO. LTD. · RUGBY · ENGLAND
Member of the AEI group of companies

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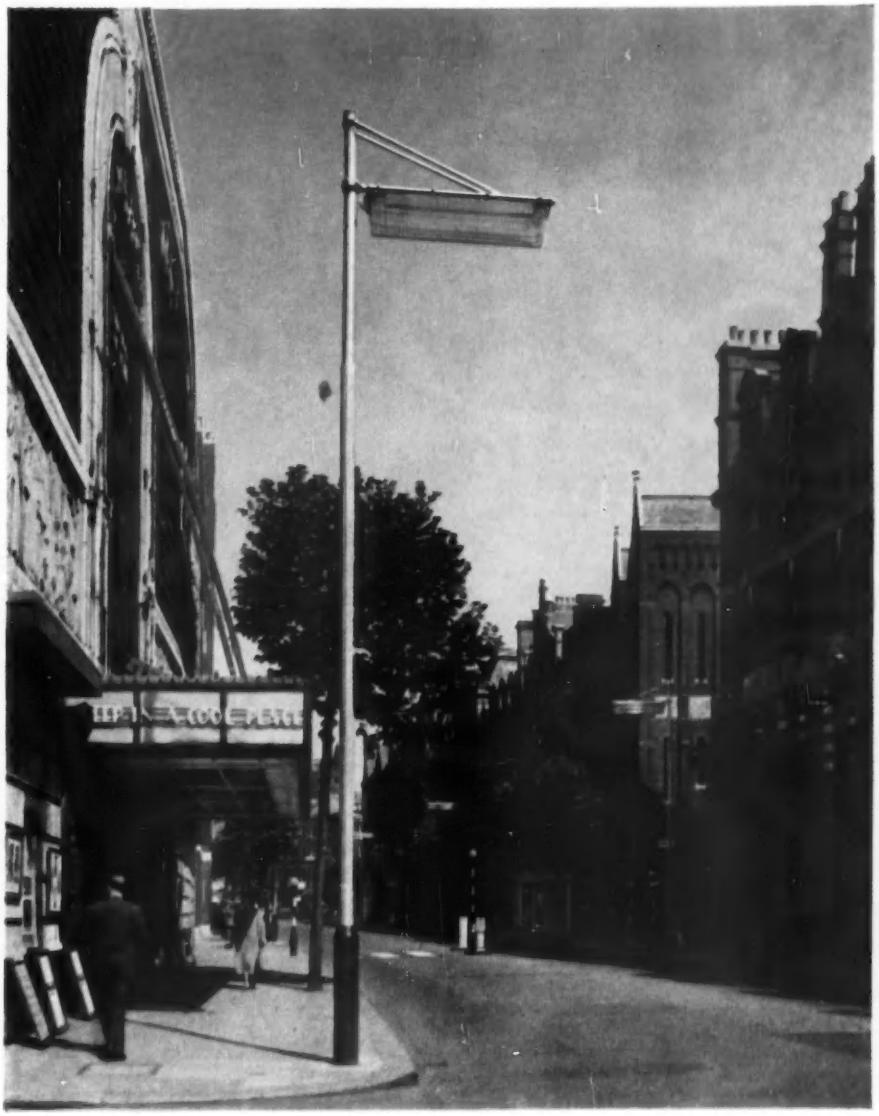


TUBULAR STEEL LIGHTING COLUMNS

Type Gb 502, 25 ft. M.H. for Group 'A' roads,

SUITABLE FOR ELECTRIC LIGHTING

The columns shown have been fitted with G.E.C. bracket arms to suit their '4-80' fluorescent lantern

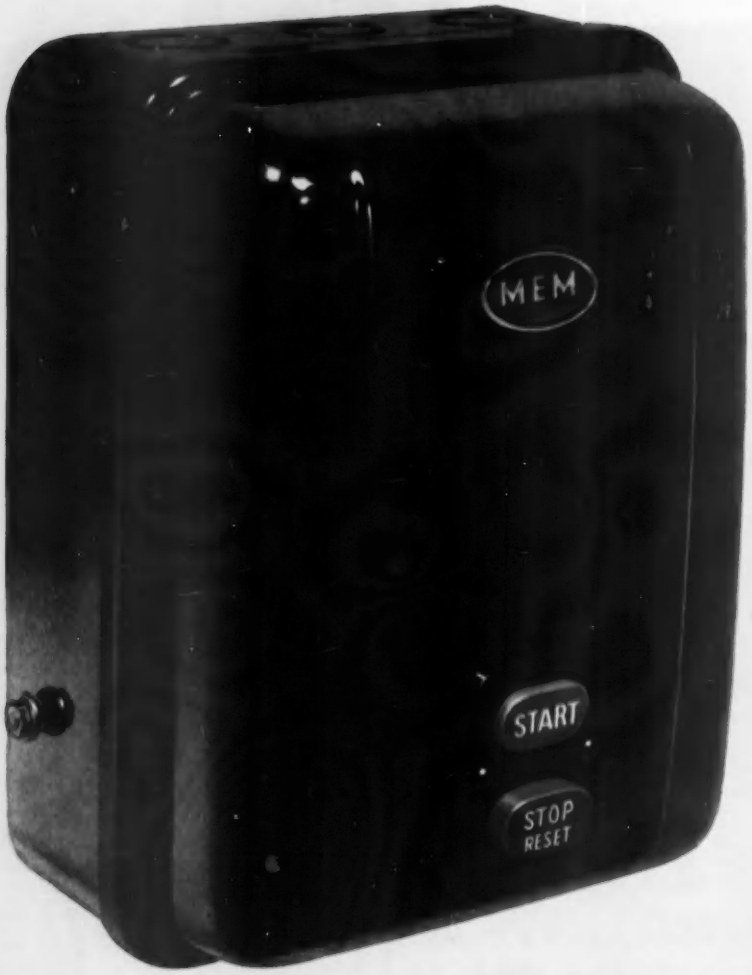
STEWARTS AND LLOYDS LIMITED

GLASGOW · BIRMINGHAM · LONDON

The largest manufacturers S&L *of steel tubes in Europe*

THE FINEST PROTECTION A MOTOR CAN HAVE...

THE NEW MEM 'Autoline' STARTERS 1½ to 15 h.p.



Do you want the finest possible starter for valuable machine tools and other vital applications? Then here is your answer from MEM, the people with more than 30 years experience in large scale production of Motor Control Gear. The Autoline is new from start to finish, and is designed to stand up to heavy duty for a very long life and give complete protection to the motor. Outstanding features include :

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- *One starter for both auto and manual resetting.*
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Close liaison between the companies of the Driver-Harris world-wide organisation is a very real and active policy. It continues to yield an impressive dividend of technical progress.

The liaison is expressed in regular communication and exchange of visits between technologists, a pooling of knowledge on every fresh aspect of wire-drawing technique, and continuous research along parallel lines between the laboratories and manufacturing plants in the United Kingdom, United States, Eire, France, Italy, Austria and Spain.

The result of that collaboration is a succession of advances in the production of nickel-alloy resistance materials of profound importance to all development in the electrical engineering world.

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"NICHROME"

"The greatest name in electrical resistance materials"

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10 Years Guarantee

HERMETICALLY SEALED TRANSFORMERS

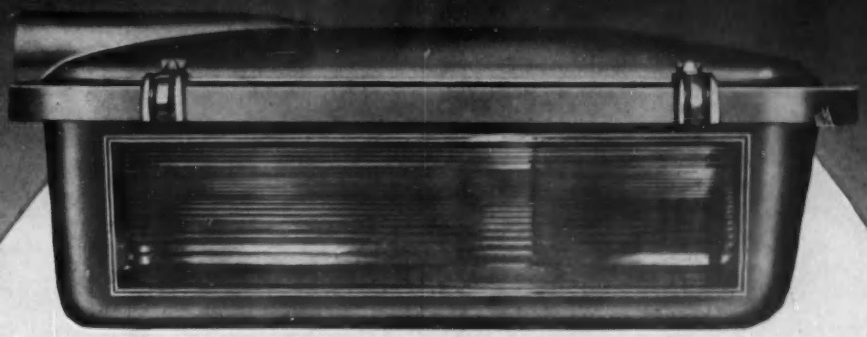
All our Hermetically sealed Transformers are guaranteed against moisture absorption and oil acidity for 10 years.
All service engineers will realise that the capitalisation of their service charges for oil testing and filtration will more than outweigh the initial small extra cost.

This is a hermetically sealed 500 kVA 3 phase outdoor type transformer.

THE LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD

ST. MARY'S ROAD, LANGLEY, SLOUGH, BUCKS.

THE GOLDEN RAY MkIII



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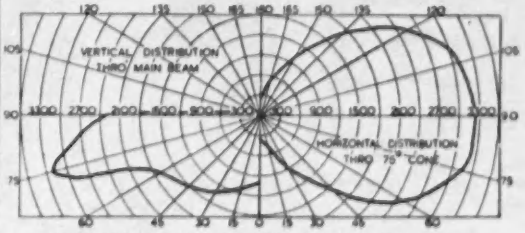
MORE Light — LESS Maintenance

THE Golden Ray Mk. III is a solidly constructed lantern, for either side or top entry. Gives maximum light with a minimum of attention.

Its high optical performance is assured by an entirely new designed machine-cut "Perspex" prismatic refractor panel which ensures an efficient and balanced light distribution on the road surface. Years of trouble-free service are assured by its sound engineering construction. Its sturdy top casting is die-cast from aluminium alloy. The refractor panel is hermetically sealed to the interior surface of the "Perspex" enclosing bowl, whilst a heavy felt gasket placed between the bowl and top casting acts as a further barrier to dust and dirt. All exterior small parts are made of stainless steel.



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INSTALLED BY LONDON BOROUGHS

Thousands of Golden Ray Lanterns have proved themselves in use with many local authorities. In Greater London alone, they have been installed by the Boroughs of St. Pancras, Walthamstow, Wandsworth and East Ham.

St. Pancras — Walthamstow — Wandsworth — East Ham

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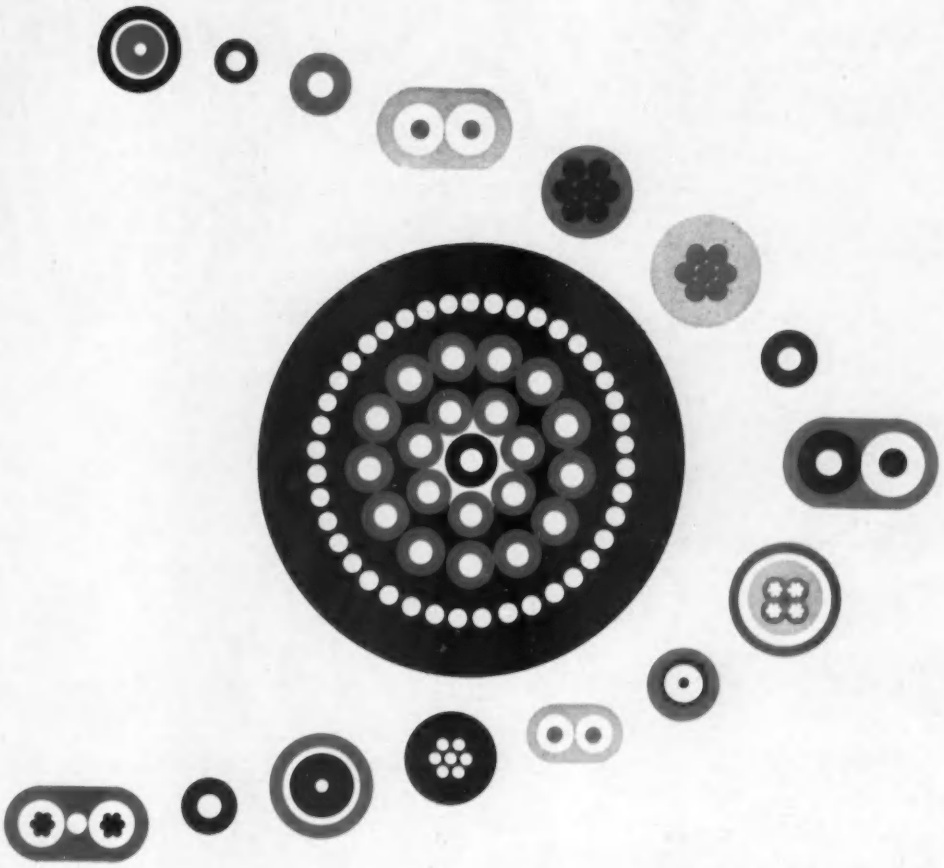

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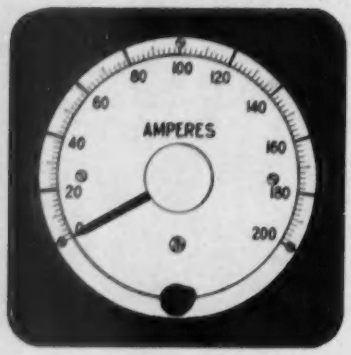

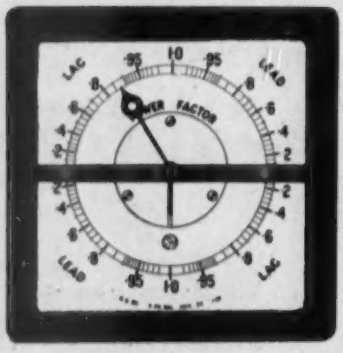

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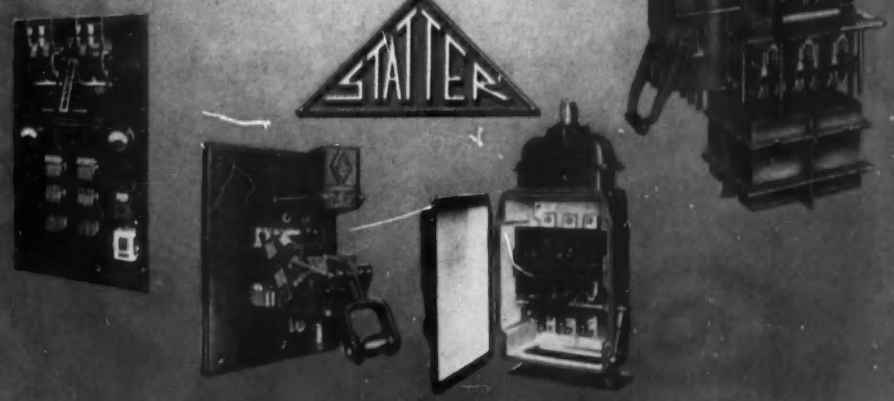

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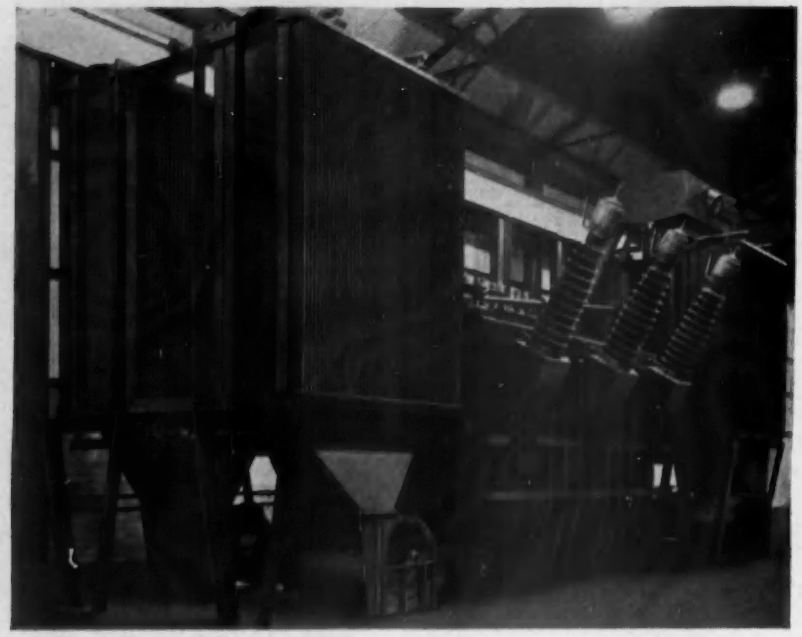

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THE CYCLONE FURNACE burns even poor-grade coals at high combustion rates, with low excess air and high ash recovery.

Enormously reduces fly-ash passing through the boiler, greatly simplifying the problem of ash and dust collection and stack emission. The *Cyclone* converts the ash to molten slag which is quenched and easily disposed of.

Achieves high boiler efficiency due to operation with low excess air, high heat absorption because of cleaner surfaces, negligible loss of unburnt combustible and lower power consumption for coal preparation—since the coal need only be crushed or coarsely pulverized.

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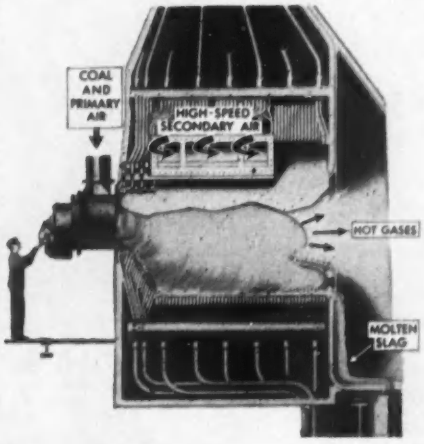
Enables greater evaporative capacity to be obtained in less total space. Smaller boilers, with less ash and dust-collecting plant and other auxiliaries, can be housed in less costly buildings.

Ideally suited to simple, automatic combustion control.



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Flexible in operation to meet wide load variations. Can be arranged for alternative firing with oil or gas.

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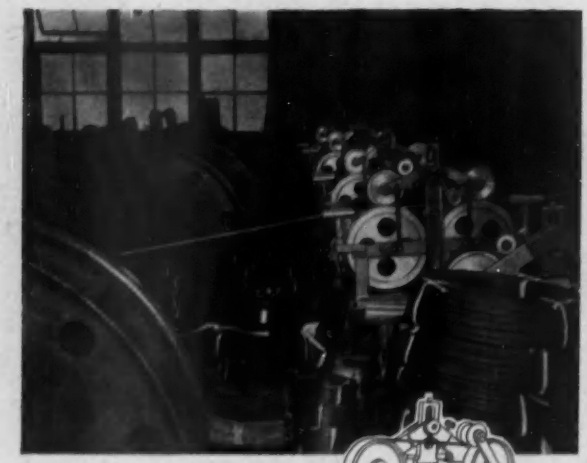

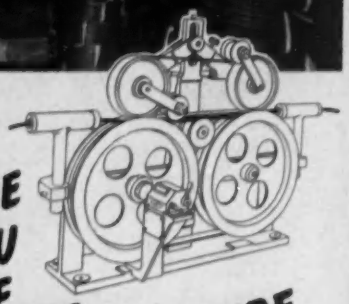

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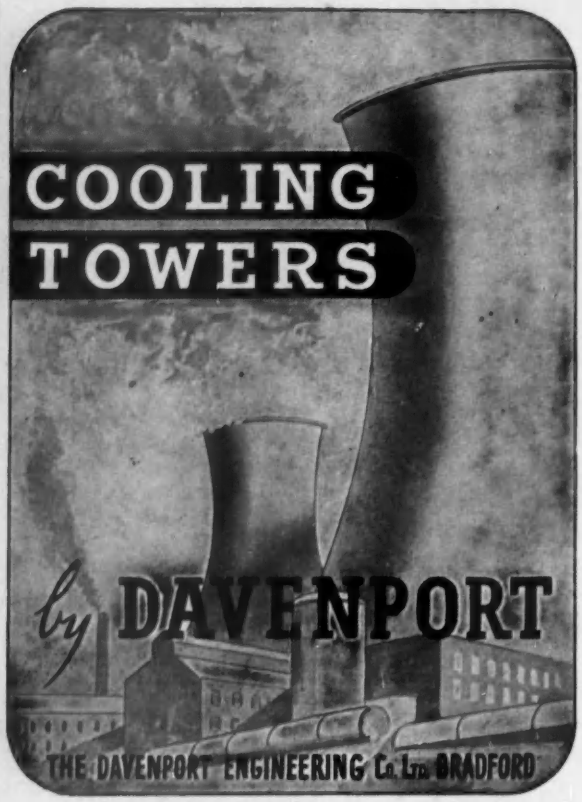

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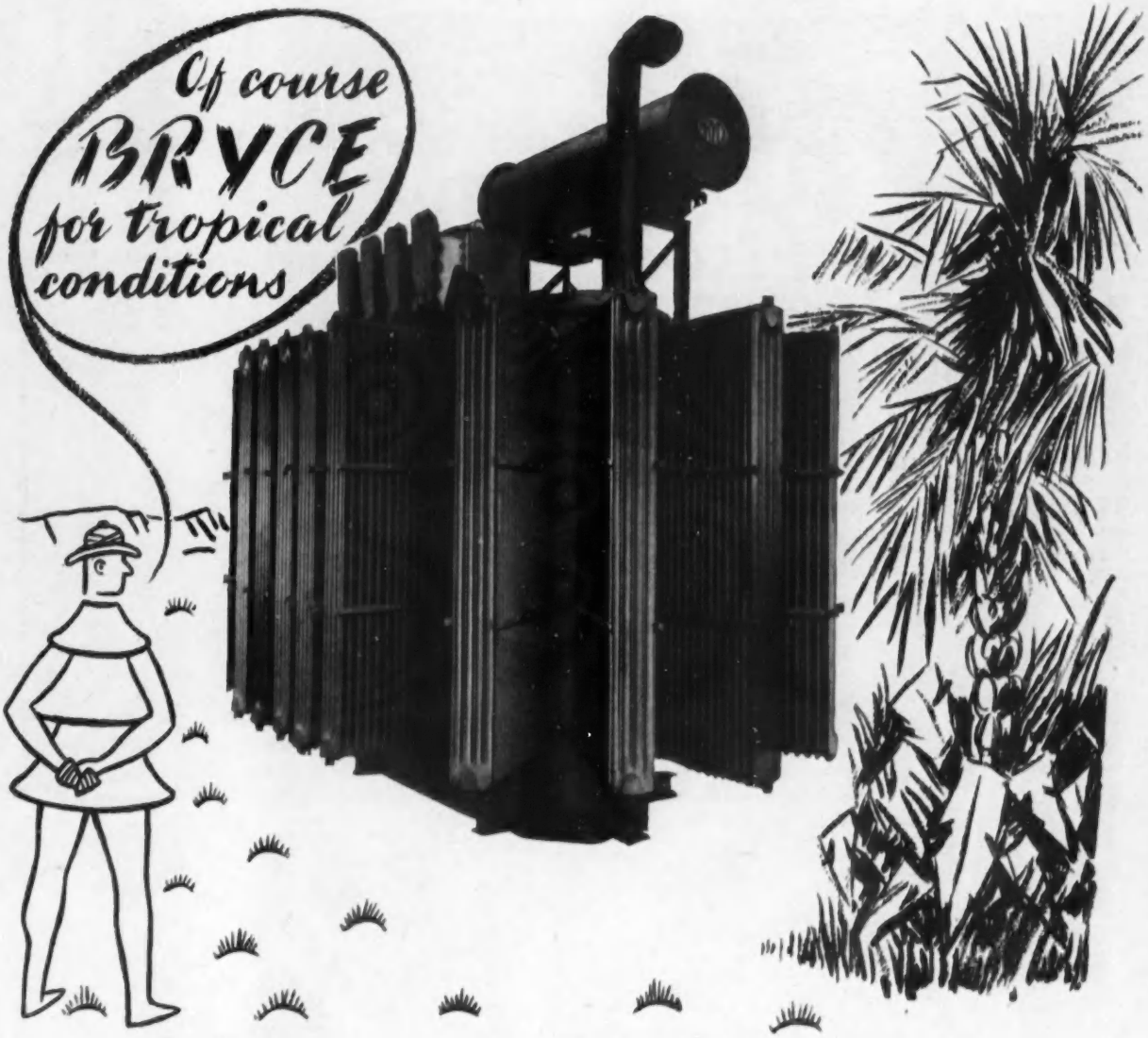

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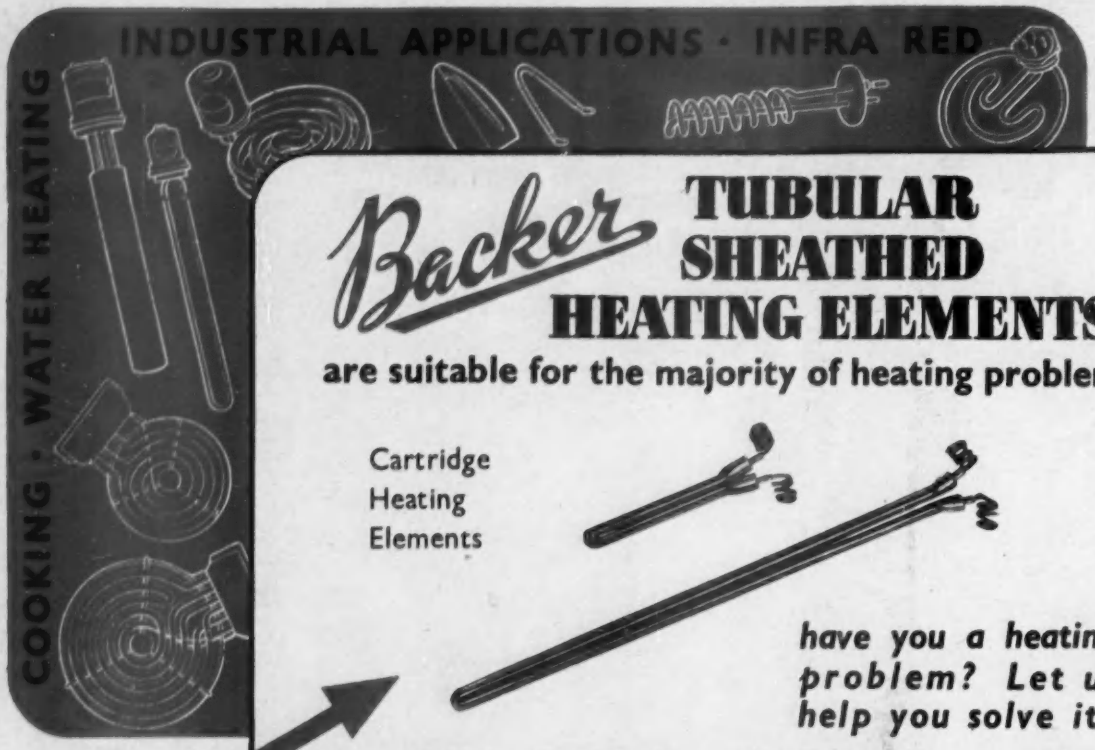

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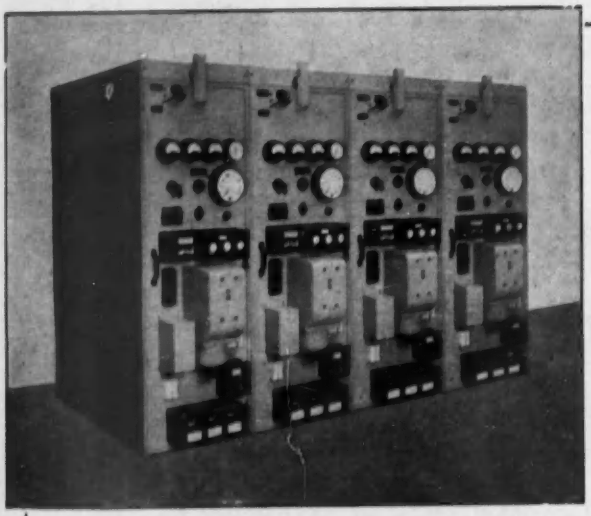

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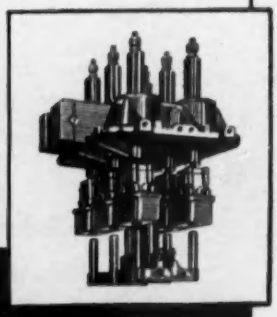
Switchgear
with
TYPE H. 25
oil circuit breakers
6·6 & 11kV.



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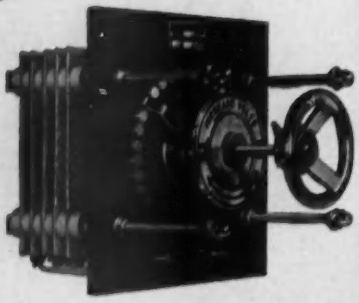

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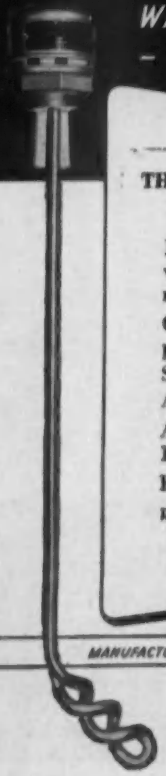

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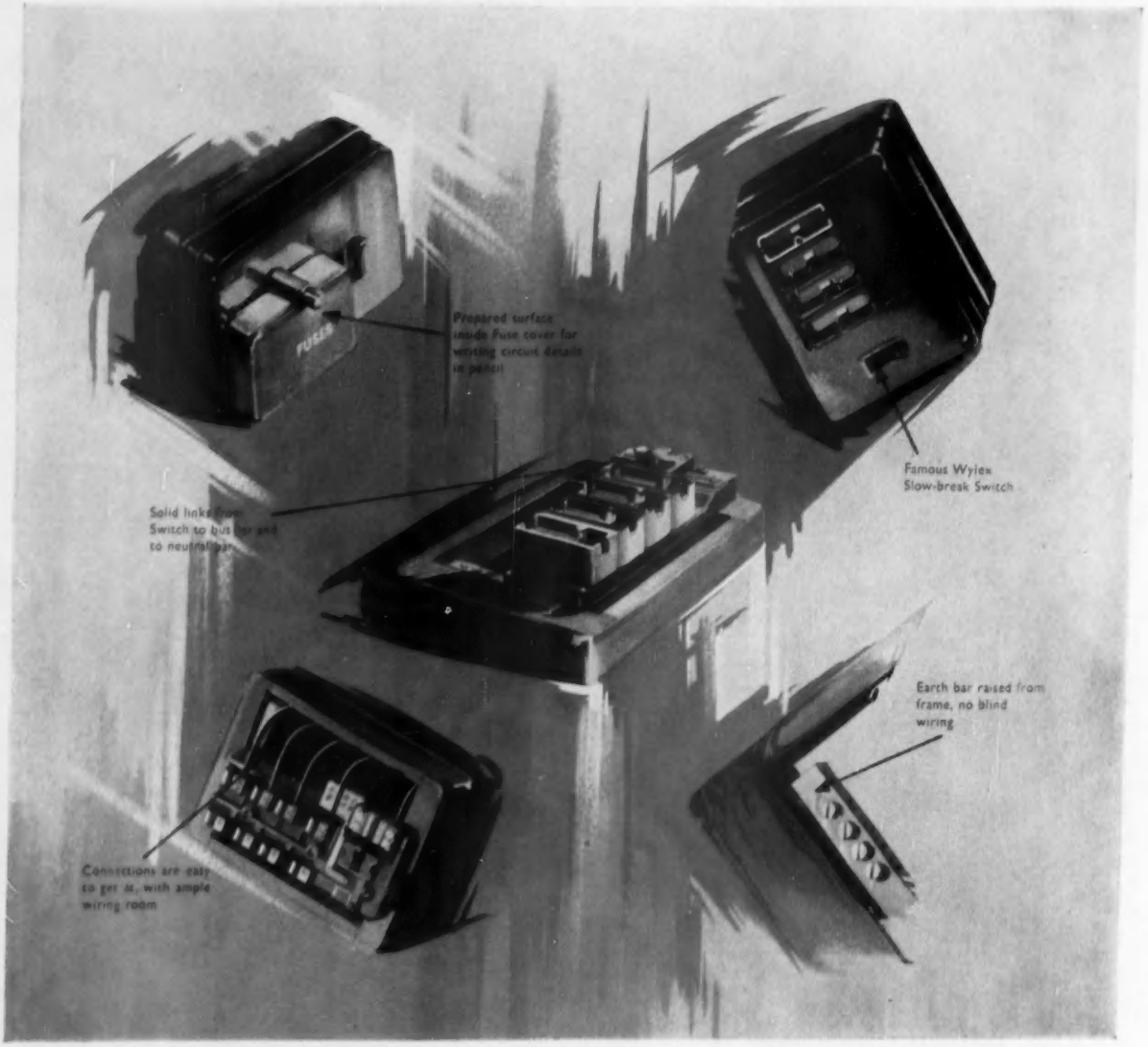
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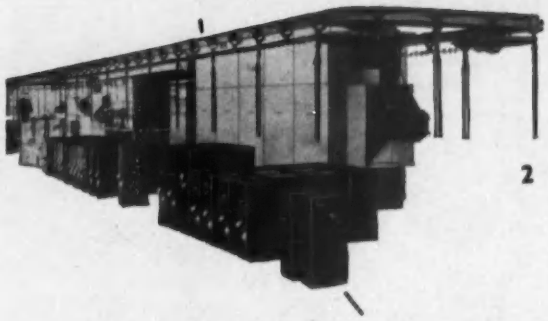

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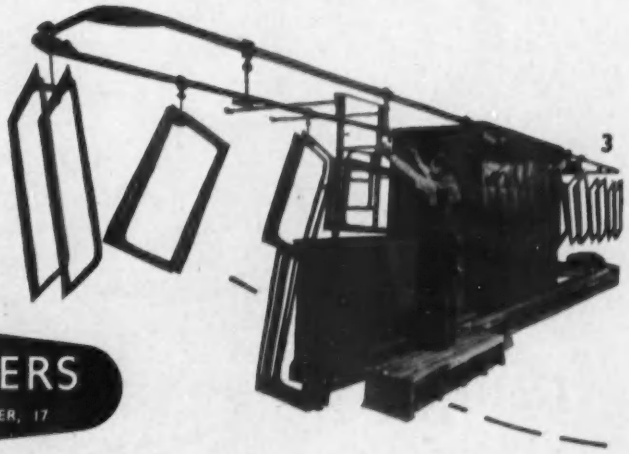
3. Window pans are stoved in 2½ minutes, using this Metrovick Infra-red plant. At the factory of the Widney Manufacturing Co. Ltd.



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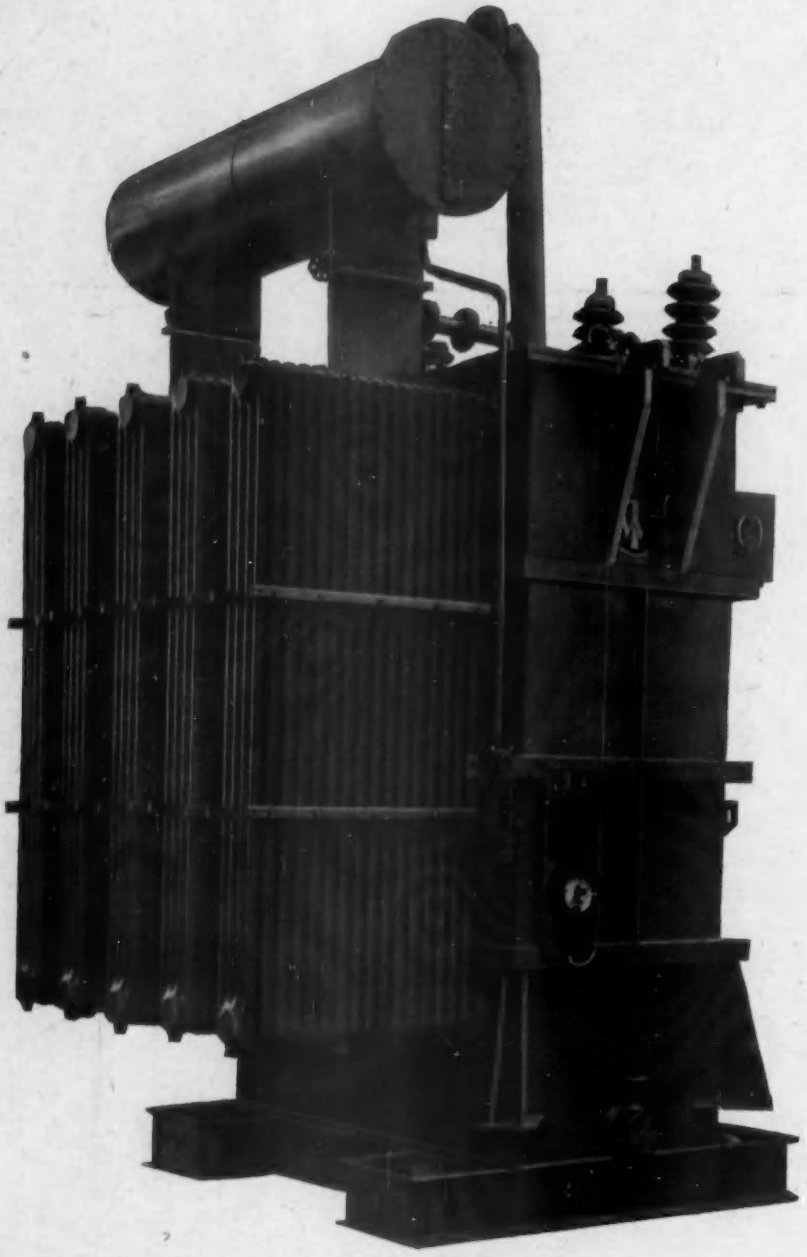

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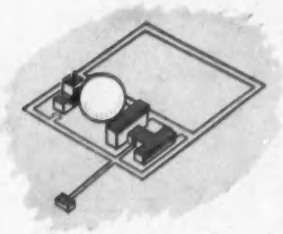

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THE FIRST "FAST BREEDER" STATION

John Thompson Ltd. are proud to announce that the Company has been entrusted by the United Kingdom Atomic Energy Authority (Industrial Group) with a most important contract in connection with Dounreay Station.

This involves the development, in collaboration with the Authority, of methods of fabrication for the liquid metal circuits, the design of complete steam and water equipment, the manufacture of the whole of the fusion-welded stainless steel vessels, liquid-metal pipelines, primary and secondary heat exchangers, boiler drums and of the associated plant, valves and instrumentation, together with the feed water treatment plant. Manufacture has already commenced.

** It was announced in the Government White Paper—"A Programme of Nuclear Power," February 1955, that it had been decided to build a "fast breeder" reactor capable of producing power on a site at Dounreay in Caithness. It was announced earlier this year that a joint study group had been formed with Associated Electrical Industries Ltd., in collaboration with the United Kingdom Atomic Energy Authority.*

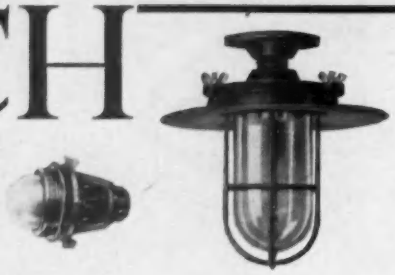
JOHN THOMPSON GROUP

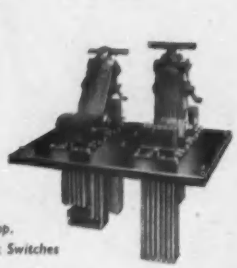
JOHN THOMPSON LTD., WOLVERHAMPTON

WT/115

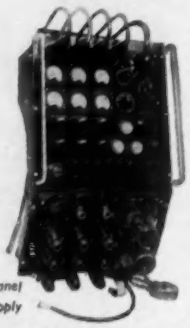
McGEOCH

SWITCH and FUSE GEAR,
CONTROL PANELS and CUBICLES,
WATERTIGHT SOCKETS and PLUGS,
INDICATOR FITTINGS and PANELS,
LIGHTING—Watertight, Weatherproof, also Decorative
LAMPHOLDERS, etc.





10,000 Amp.
Slow-break Switches



27½ K.V.A. Control Panel
for Ministry of Supply

Registered
Est'd 1832
Trade Mark

WILLIAM McGEOCH & CO. LTD. BORDESLEY, BIRMINGHAM, 10
also at GLASGOW, and LONDON

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ask for "ASHLAM" Laminates

"ASHLAM" Laminates are produced from paper, cotton fabric and fibreglass base materials. The fibreglass grades are bonded with Silicone, Melamine, Phenolic and Polyester type resins, and have very high dielectric and insulation properties.

"ASHLAM" Laminates are also available in the form of tubes with fibreglass base bonded with Polyester and Silicone resins.

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Ashdowns Limited is a subsidiary of Pilkington Brothers Limited. "ASHLAM" is the registered trade mark of Ashdowns Limited.

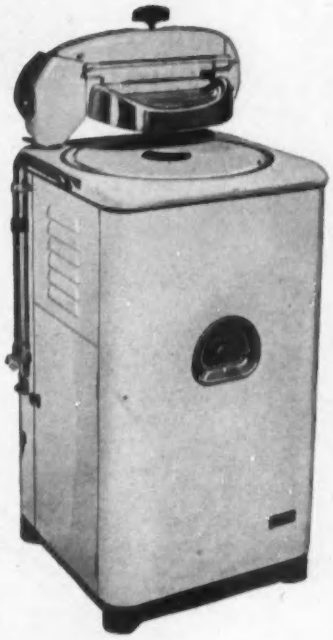
Mrs. Brown is selling for YOU!

Six star points have quickly won for the Parnall Washer that jackpot of salesmanship—USER RECOMMENDATION.

These star points are worth a moment's study.

1 APPEARANCE
No other washer compares in elegance with the Parnall, and women are deeply influenced by design in their choice of domestic appliances.

2 QUALITY CONSTRUCTION
Your own specialized knowledge will approve the fine engineering that lies behind the Parnall's superb appearance.



3 EFFICIENCY
The unique Parnall agitator provides a scientific water-action that *really* gets clothes cleaner.

4 EASE OF OPERATION
Standard sink height obviates stooping. Power washing, wringing and emptying mean less exertion.

5 RELIABILITY
In addition to carrying the seal of the Good Housekeeping Institute the Parnall has our own twelve months' guarantee, most generously interpreted: plus nation-wide service organization.

6 PRICES:
Such value for money at £65.2.0 (or £75.12.0 with own heating element)—no wonder Mrs. Brown is selling for you! Wherever there's a Parnall User, she's busy telling her friends to buy one.

P.S *And don't forget that the Parnall is supported by* consistent *nation-wide advertising, displays, showcards, leaflets and demonstrations at Exhibitions — with enquiries passed to YOU!*

PARNALL World's Best Safety Washer!

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WHG/P30

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Craftsman's Choice

PLIERS · PINCERS · NIPPERS
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HIVAC NEON INDICATOR LAMPS

are of the highest quality, resulting in exceptionally long life and extreme reliability.

Leading manufacturers of electrical equipment and of indicator lamp fittings already specify HIVAC.

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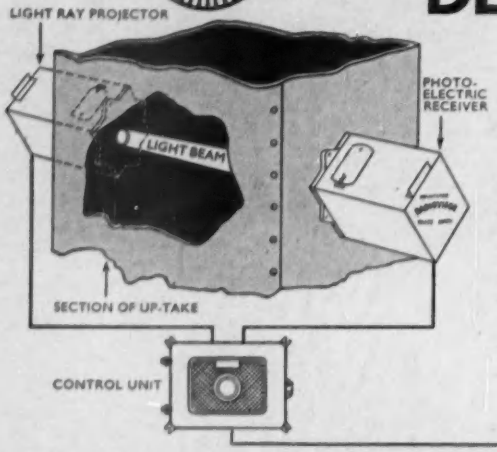
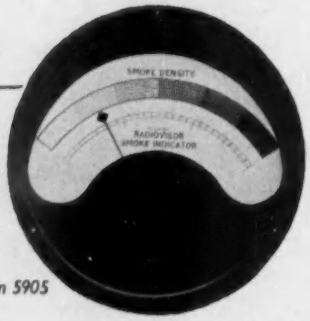
INDUSTRIAL SMOKE DENSITY INDICATOR

Used by Leading Industrial Companies for the past 25 years



The Radiovisor Industrial Smoke Density Indicator is in extensive use in Power Stations and Industrial Installations to give a continuous record of the smoke passing through a flue or up-take. A beam of light is projected across the flue on to a Photo-Electric Cell. The intensity of light received by the latter, and consequently the photo-electric current, is governed by the smoke density. After amplification, the photo-electric current is indicated on instruments having a Ringelmann Smoke Scale. The Radiovisor Smoke Density Indicator operates during the whole 24 hours, indicating and recording the density of smoke emitted and showing the operator when attention is needed. In addition, an accurate record is available to the Management to prove they are not contributing to air pollution. *There is a range of standard equipment to cover all sizes and types of installations.*



OTHER RADIOVISOR PHOTO-ELECTRIC & ELECTRONIC CONTROLS include:

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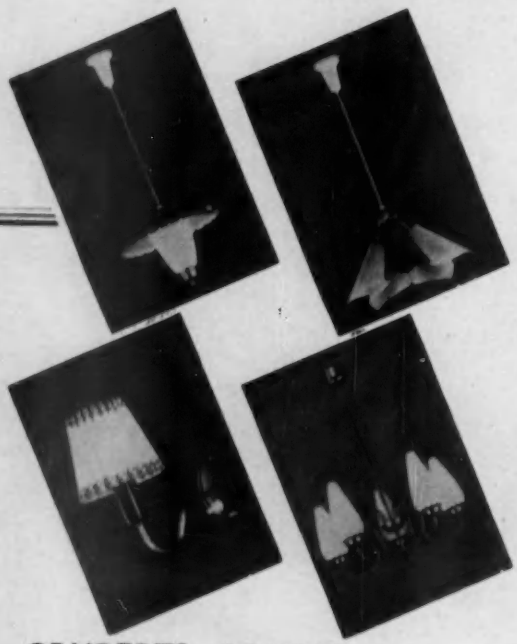
THE FIRST NAME IN PHOTO-ELECTRIC CONTROLS



GRUBERTS SØNNER

Will be exhibiting their Contemporary and Traditional electrical fittings of the latest Danish design at an Exhibition to be held at the Mostyn Hotel, Portman Street, London, W.1, from 18th—23rd July, 1955.

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and be certain of

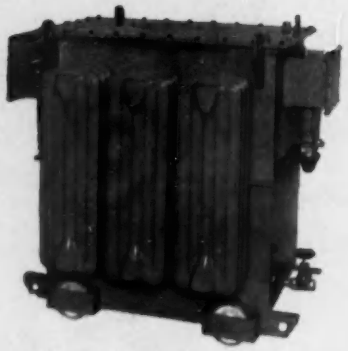
SATISFACTION

Sturdy Transformers are manufactured for all industrial applications from 1 kVA to 100 kVA.

They are being supplied regularly to Government Departments — N.C.B. C.E.A. and many large industrial users.

OUR MANY CUSTOMERS ARE OUR RECOMMENDATION

Our technical service is at your disposal.



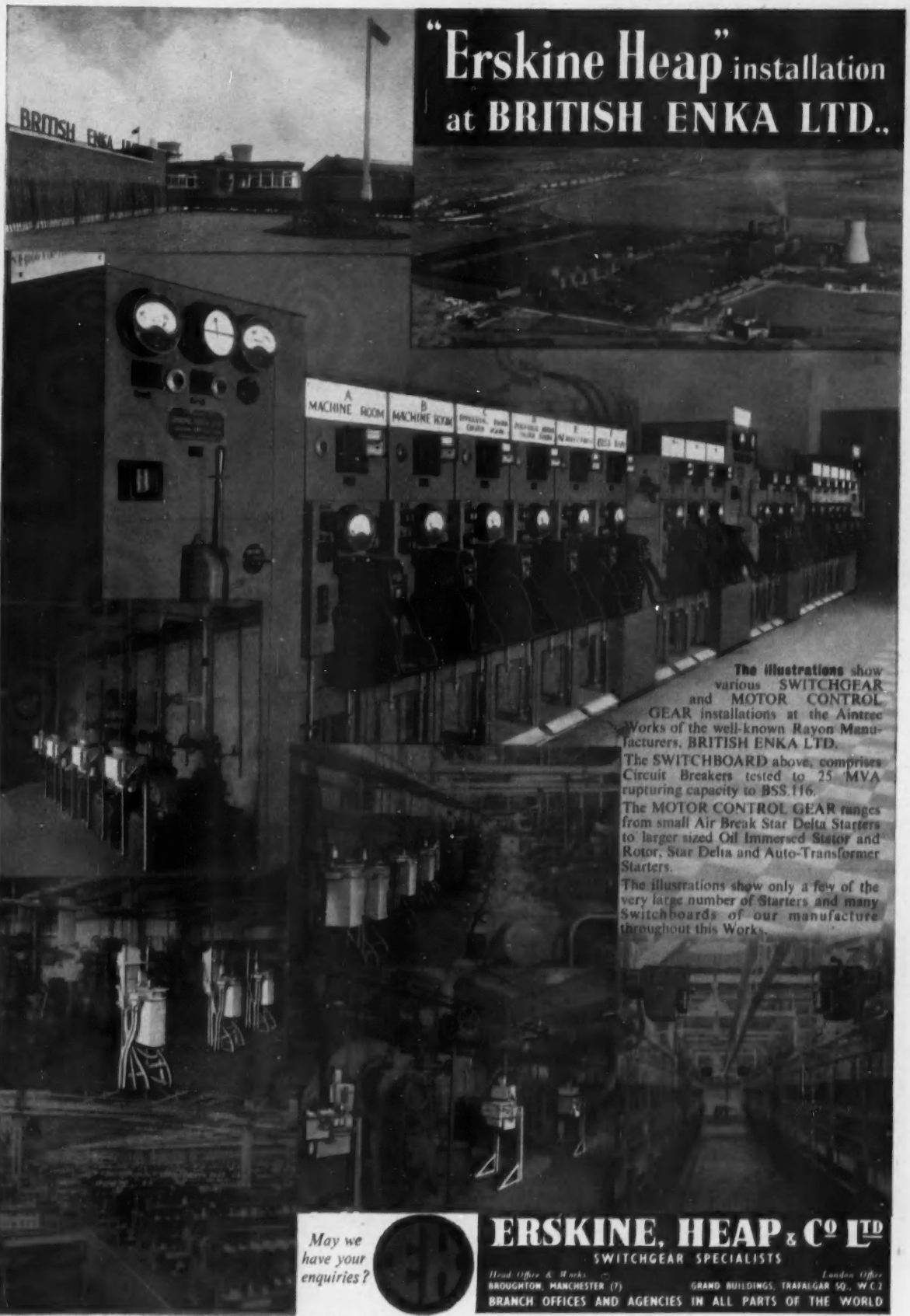
Write for our illustrated brochure

STURDY ELECTRIC COMPANY LIMITED

BURNOPFIELD NEWCASTLE UPON TYNE

Telephone : Burnopfield 237

"Erskine Heap" installation at BRITISH ENKA LTD.,



The illustrations show various SWITCHGEAR and MOTOR CONTROL GEAR installations at the Aintree Works of the well-known Rayon Manufacturers, BRITISH ENKA LTD.

The SWITCHBOARD above, comprises Circuit Breakers tested to 25 MVA rupturing capacity to BSS.116.

The MOTOR CONTROL GEAR ranges from small Air Break Star Delta Starters to larger sized Oil Immersed Stator and Rotor, Star Delta and Auto-Transformer Starters.

The illustrations show only a few of the very large number of Starters and many Switchboards of our manufacture throughout this Works.

May we have your enquiries?

ERSKINE, HEAP & Co LTD

SWITCHGEAR SPECIALISTS

Head Office & Works — BROUGHTON, MANCHESTER (7)

London Office — GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

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WELCOME TO OUR STAND Nos. 34 & 35 GALLERY, GRAND HALL, OLYMPIA. ENGINEERING, MARINE & WELDING EXHIBITION. Sept. 1 to 15

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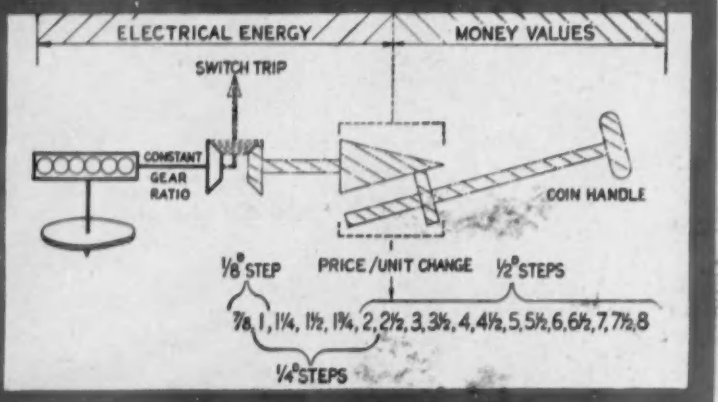
No. 3 *in a series of announcements*

Price change

does not alter load on meter

Changing the price per unit is carried out by moving a small self-locking lever; there are no loose parts to get lost. The change does not alter the load on the meter; as indicated in the illustration below, the gearing between the meter spindle and the trip lever is the same at all prices per unit.



FERRANTI FMP

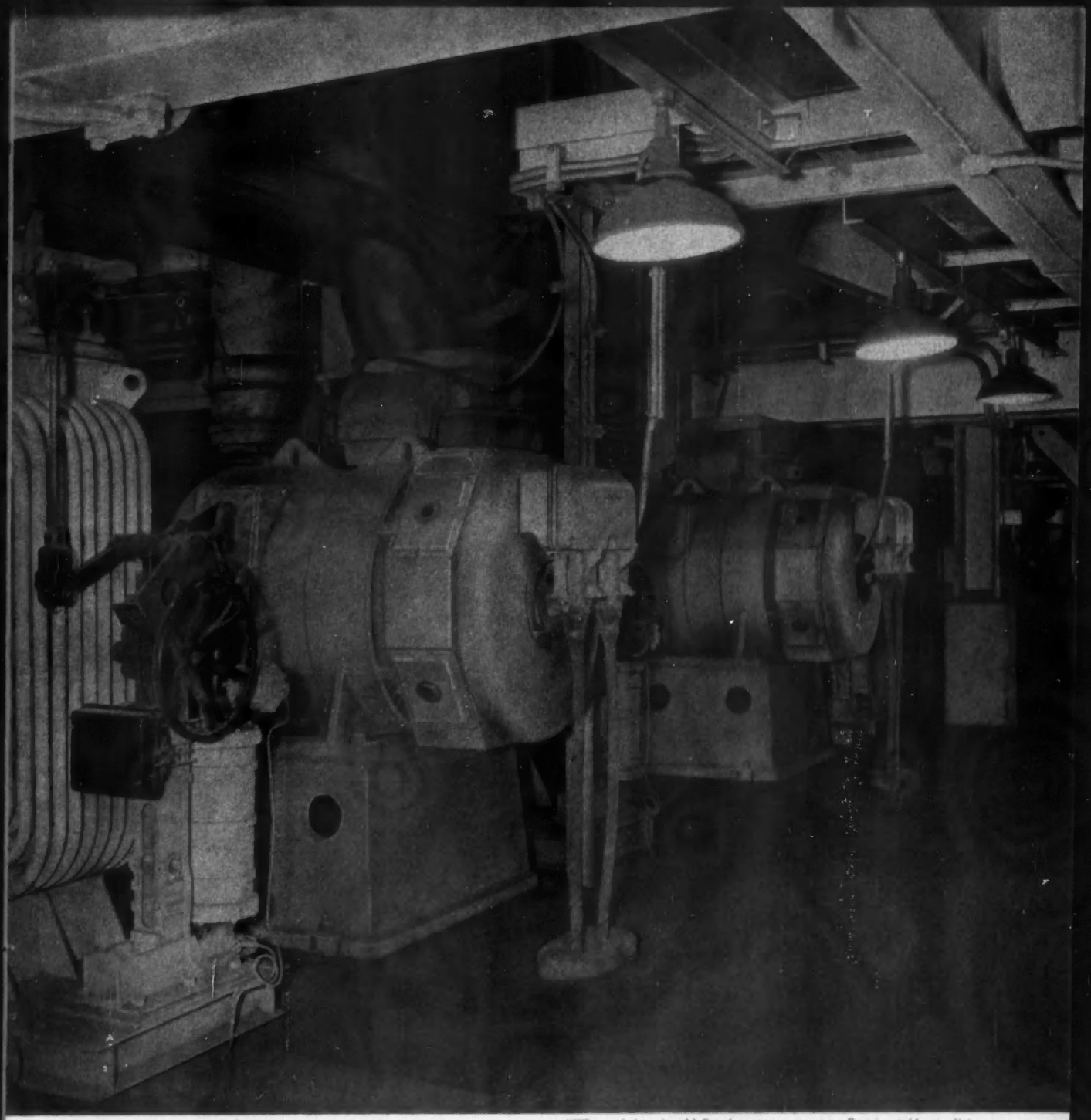
PREPAYMENT METER

- Simple Price Change
- The Ferranti 100 amp. Micro-gap Switch
- Ease of collection
- Coin mechanism readily detachable
- Fixed charge collector mechanism

FERRANTI LTD · HOLLINWOOD · LANCS
LONDON OFFICE · KERN HOUSE · 36 KINGSWAY · WC2

FERRANTI

FM. 116/2



Two of the nine N-S exhauster motors at Pyrmont (Australia) power station. The motors are of 100/28 h.p., 1,475/920 r.p.m., with their induction (speed) regulators actuated by Bailey regulators.

N-S MOTORS SERVE ELECTRIC POWER

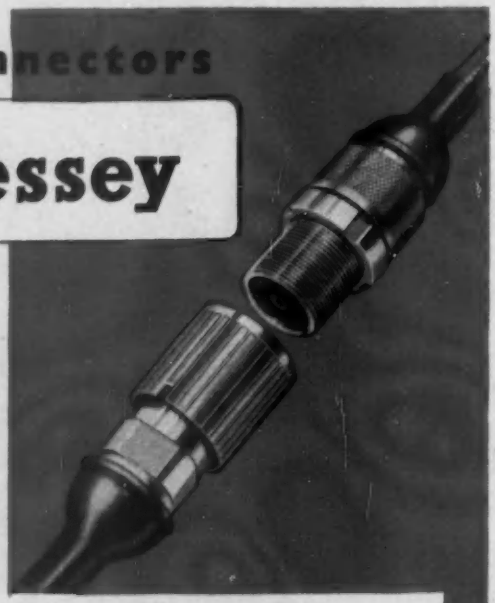
In more than a hundred power stations at home and abroad, N-S variable speed a.c. motors, driving draught fans and other auxiliaries, are reducing operational losses and improving the efficiency of combustion control sytems.

LAURENCE, SCOTT & ELECTROMOTORS LTD.

NORWICH, MANCHESTER & BRANCHES

For special purpose connectors

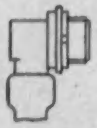
...contact Plessey



Plessey have long specialised in the design and mass production of miniature electrical connectors of high reliability.

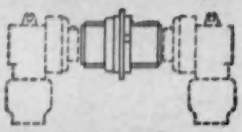
In particular, Extra High Tension connectors having high insulation properties and suitable for high voltages, are available. There are two types, Demountable (7kV. peak) as illustrated and Moulded (10kV. peak) as shown in outline. Both are interchangeable and units of each are obtainable for free cable, bulkhead or panel installations.

EHT CONCENTRIC TYPES



Panel plug or socket

Cable plug or socket



Bulkhead connectors

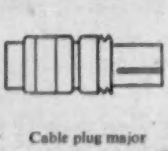
SHF TYPES

Plessey also manufacture a range of highly efficient interchangeable connectors for the effective and reliable termination of Uniradio Cable operating equipment in the Super High Frequency bands (above a hundred megacycles and up to 10,000 megacycles).

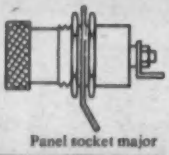
Basically designed for 70-80 ohm lines these units are standardised so that no confusion can arise when making connections between various S.H.F. devices.

Cable plug minor

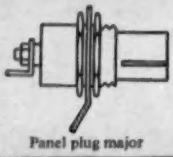
Cable socket minor



Cable plug major



Panel socket major



Panel plug major

These Publications are available to manufacturers on request . . .

Publication No. 560/1 on Plessey E.H.T. concentric connections.
Publication No. 672/1 on Plessey S.H.F. connections

THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

PB2a

'Superform' switchboards

for the control of MEDIUM VOLTAGE circuits

Incorporating H.R.C. CHASSIS TYPE FUSE-SWITCHES in ratings up to 750 amps.

Illustration shows duplicate busbar switchboard in course of installation at Bowaters' Lloyd Pulp & Paper Mills, Limited, Sittingbourne, Kent.

MODERN STYLING: Easy to clean smooth flush contour. Retractable switch operating handles.

SAFETY FEATURES: Busbars, connections and terminals fully insulated. Potential circuits fused at supply point. Integral cylinder locks fitted to fuse-switches.

PERFORMANCE: Fuse-switches proved for making capacity on 50 MVA. at 440 volts, 3-phase, 50 cycles.

ACCESSIBILITY: Hinged instrument panels give ready access to instruments, terminal boards and small wiring.

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fusegear

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Fusegear Works, East Lancashire Road, Liverpool 10

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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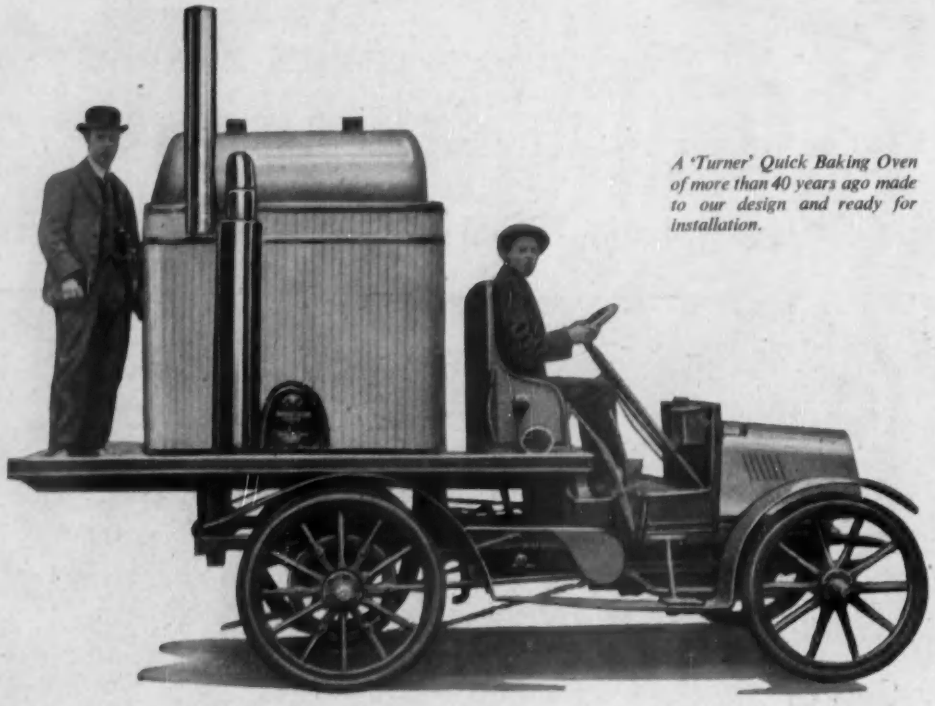

A 'Turner' Quick Baking Oven of more than 40 years ago made to our design and ready for installation.

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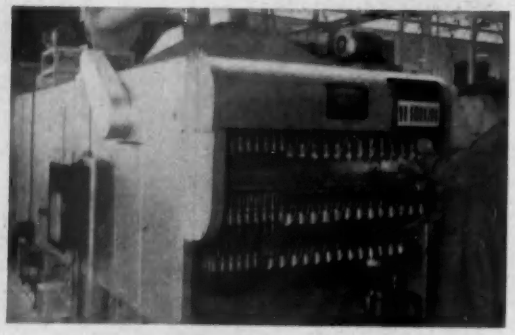
and not only the er—vehicle ! Over 60 years ago STERLING began to specialise in the production of insulating varnish, culminating today in a world-wide service. Varnish manufacture whilst still the basis, is now but a part—STERLING Chemists and Engineers give a complete service to the large or small user. They ensure that the best type of varnish is made for your needs and that it is applied by the most efficient and economic plant. You are invited to make use of their services.



A typical STERLING Installation—impregnating 20,000 field-coils and armatures by the cold dip and bake process, at Messrs. S. Smith and Sons (Eng.) Ltd.

Sterling
INSULATING VARNISHES

THE STERLING VARNISH CO. LTD.

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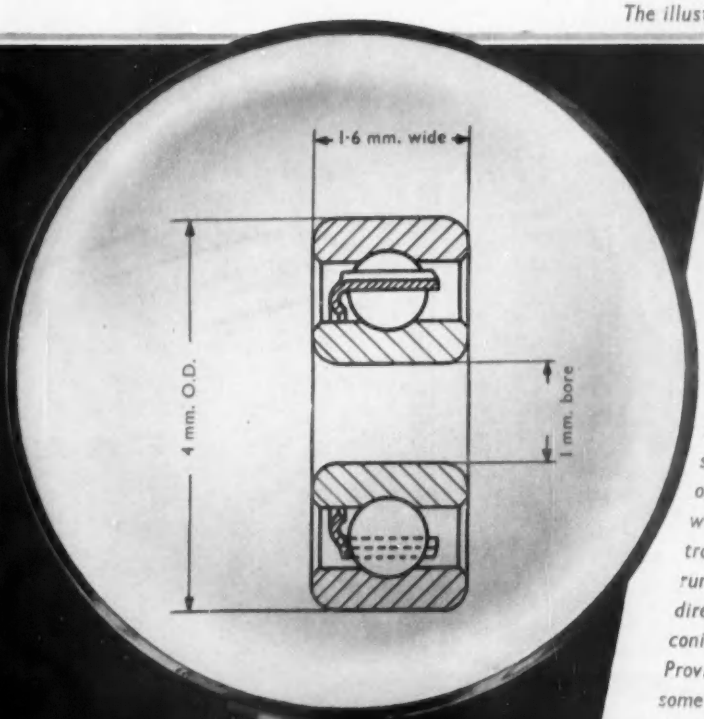
Miniature bearings

TO ANY SIZE AND SPECIFICATION

The illustration shows a typical example



As a result of our experience in making these bearings, they have extremely low starting and running friction. Bearings range in size from 1·5 mm. O.D. to 10 mm. O.D. Some are complete single-row bearings, others have cups with self-aligning tracks, the user running the balls directly upon a conical spindle end. Provision is made in some of these for the spindle to pass through the cup.

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BALL AND PARALLEL-ROLLER BEARINGS
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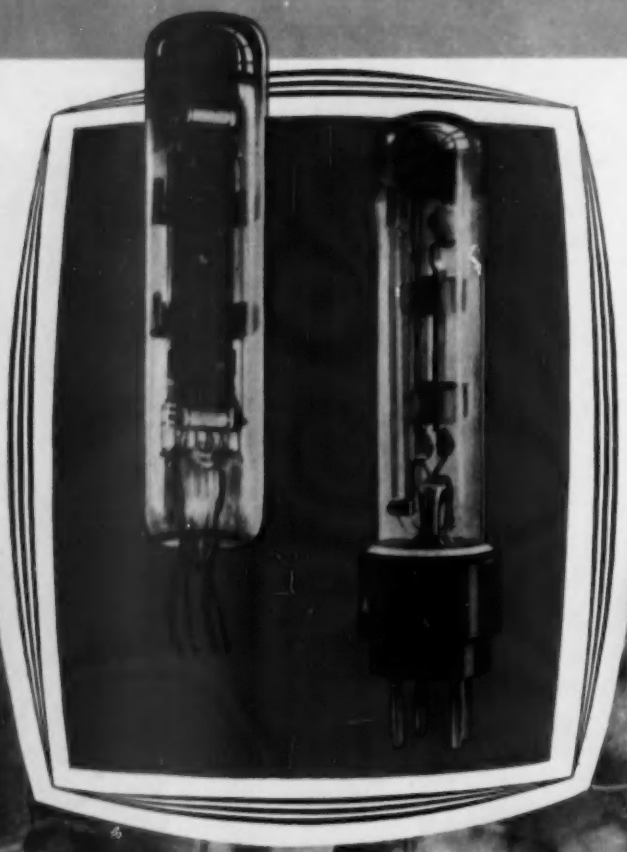

Where reliability is essential . . . . .

BRITISH INSTRUMENT INDUSTRIES EXHIBITION
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STAND 17 BLOCK C

Every year millions of chicks are hatched in incubators controlled by SUNVIC THERMOSTATS and SUNVIC HOTWIRE-VACUUM-SWITCH RELAYS. In such an application it is vital that the control equipment functions accurately and dependably day in and day out. That is why hatcheries everywhere use equipment by Sunvic.

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LANTERN AND POLE BLEND INTO ONE SWEEPING LINE IN THE

Siemens 'Kuwait' Lantern

Regd. design No. 875686

New methods of fixing, new design, new optical system combine to provide a new gracefulness in street lighting standards. The Siemens 'Kuwait' Lantern can be harmonised with any surroundings, thanks to its own lines, and a range of over ninety 'Haligloss' finishes. Its efficiency as a lighting unit, its ease of maintenance, its freedom from complications are features for which every Siemens lantern is renowned.

Here briefly are the special points about the 'Kuwait' Lantern:

* Unique method of fixing to steel, concrete or wood poles. Brackets are not required.
* Combined reflector and bowl optical system.
* Totally enclosed single-bolt bowl fixing, seating on new type of gasket.
* Completely self-contained wired control gear.
* Carries two or three 5' 80 watt Sieray Tubes.

SIEMENS ELECTRIC LAMPS & SUPPLIES LIMITED

Member of the A.E.I. Group of Companies

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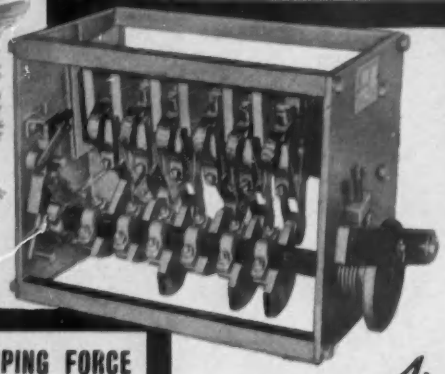
SIEMENS ELECTRIC LAMPS AND SUPPLIES

SHARP CONTROL GEAR
FOR ELECTRIC VEHICLES.



TYPE P.V. CONTROLLER

Pedal operated giving up to 5 speeds of control. Fitted with cam operated contactors and permanent magnet blow-outs. Limiting mechanism provided to prevent rapid acceleration and arrangement can be made for interlocking electrically with reverser unit.

Particulars on request.

Rating: 80 volts, 75 and 150 amps. D.C.

POWERFUL WIPING FORCE MINIMISES CONTACT EROSION AND PREVENTS WELDING

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Sharp Control

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is the enemy of lamp economy, it is responsible for enormous losses.

Whenever you meet this problem in works, mills, or factories, you will find an easy solution in the use of

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BRITAIN'S BEST SHOCK ABSORBER

Nearly a quarter of a million in use

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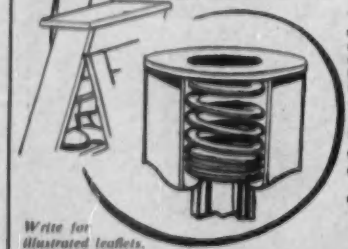

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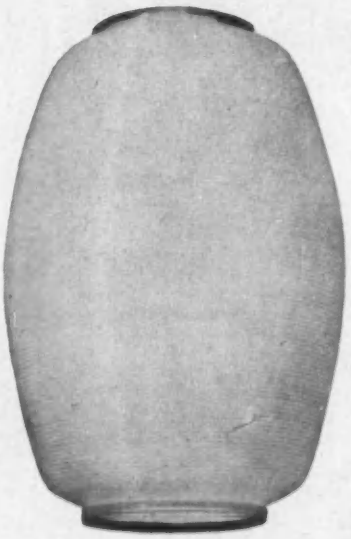

TOP RIGHT: Atlas lighting fitting in 'Rotaflex' design No. RXS 0200. Lower half is in pearl with upper half in crystal mix to provide generous upward lighting. This shape is available in two sizes to suit lamps from 60-200 w.

ABOVE LEFT: Atlas design No. RXA 0200 again has a lower half of pearl 'Rotaflex' and upper half in crystal mix. This design, however, can be used equally well in an inverted position, effective light distribution being provided in both upward and downward directions.

LEFT: Another attractive design—No. RXB 0200, in pearl 'Rotaflex' only, available in two sizes. All these fittings can be used with batten or cord lampholders. Galleries are carefully matched to sizes of fittings and lamps.

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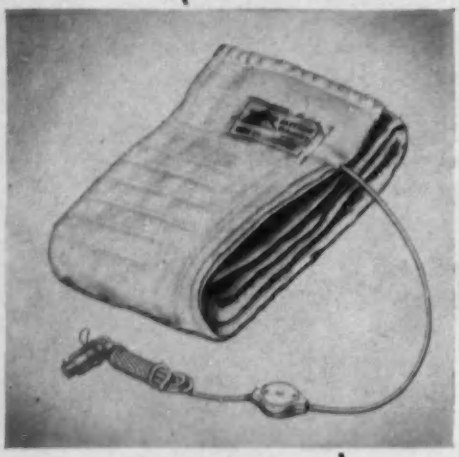

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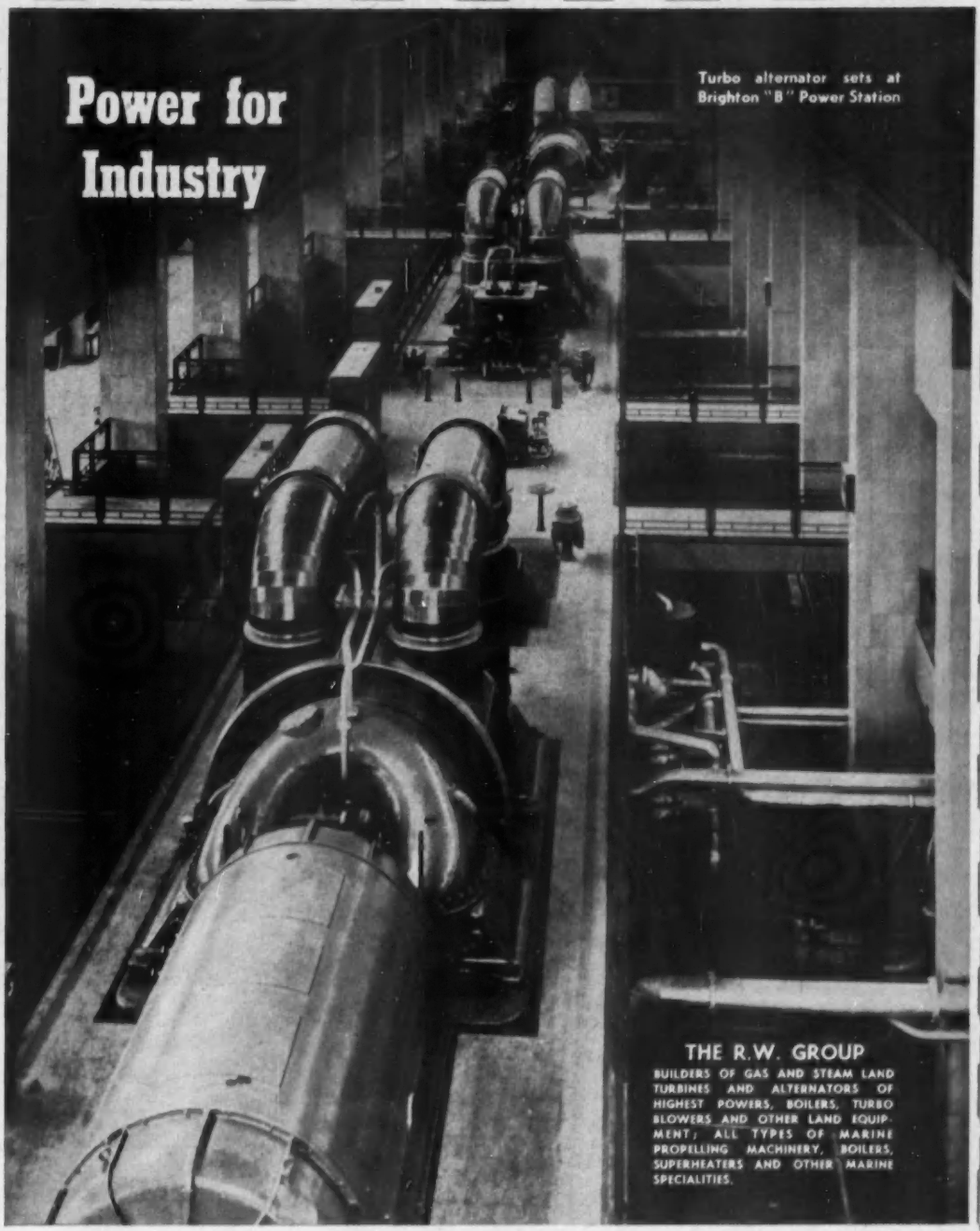

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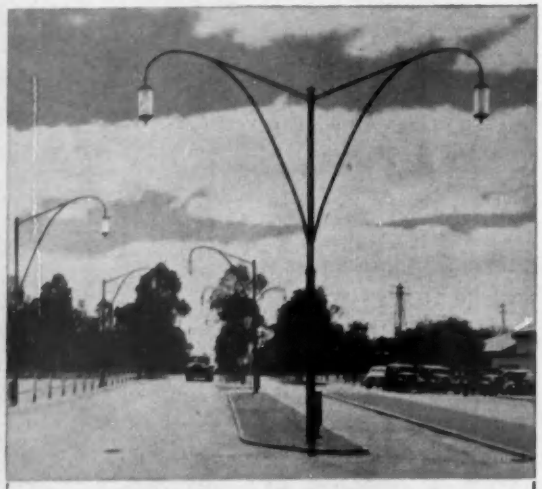

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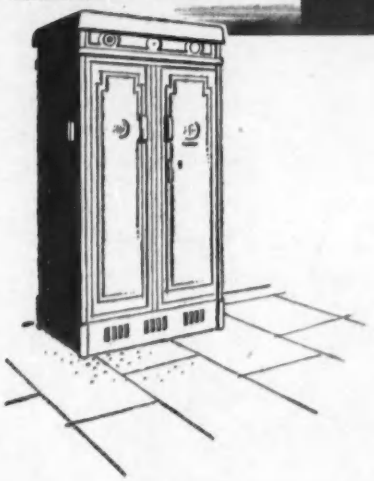

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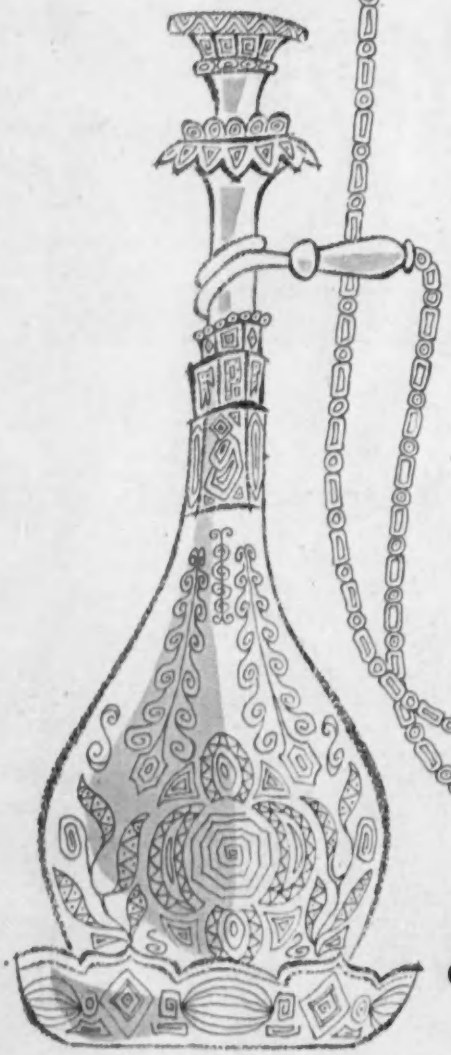

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ELECTRICAL TIMES

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F

THE WAY AHEAD

The future holds elements of both hope and uncertainty, and both these factors are apparent in the papers which are being presented this week to the British Electrical Power Convention. Any consideration of the future of the electricity industry must have at its heart the assurance of ample energy for all needs, which has flowed from developments in nuclear engineering. This has provided the long-term counter to the shortage of fuel which at one time seemed likely to afflict the high hopes for further unrestricted advance to an all-electric age. Now the Convention is able to deliver this year its mass public pronouncement of faith in the remoteness of saturation of demand, without the spectre of a fuel-less future to make the boast seem hollow. Representatives of several industries will give detailed descriptions of how their use of electricity will grow, and if nuclear energy develops in the way expected, their needs will be met—in the long run. The uncertainty in this exercise in searching the energy needs of the future looms largest in the next two or three decades. Present plans for nuclear power station construction suggest that in ten years' time there will be no more than 2,000 MW of uranium-consuming generating plant in operation in this country: and forecasts put the total needs by that time at 30,000 MW. Even allowing for the fact that the nuclear stations will operate at high load factor, there is a risk that the coal position will have become desperate. Large-scale use of oil seems the only hope for filling this gap for this period, and the C.E.A. is resolutely pursuing its possibilities, but as Sir Harry Railing emphasises in his presidential address to the Convention, the time expensively purchased by this stratagem must still be used to develop coal output at the maximum rate possible. Moreover, as there is no particular virtue in nuclear fuel as an energy source except the untapped reserves it offers, research into other substitutes for coal, such as the application of solar energy, should be pressed forward. The message of the Convention seems to be, that a promised land awaits—but that there are many terrors of a fuel-short wilderness to be braved before it is reached.

SELLING THE ATOM

U.S. activity in the field of nuclear power generation has up to now been a curious mixture of enterprise and reticence. The stage is now being reached where America's actions in this respect are taking on a new commercial importance for nuclear engineering is, before long, going to be the technical export *par excellence*. With its high content of skill it is

giving an opportunity for selling abroad of the sort Great Britain must seize if position and population are to be maintained. The immediate post-war policy of the U.S.A. in clamping down on nuclear information even to allies who had helped obtain it was a hard blow, from which Britain has fought back compactly and forcibly to a standard of achievement in nuclear knowledge and practice, where talks on a level basis have become in the interest of both countries. It is to this achievement that the international agreements on co-operation in the nuclear field pay effective tribute. But these agreements are not the only recent American move in this field. A further significant step forward has been President Eisenhower's "Atoms for Peace" plan, which provides for grants towards the cost of research reactors in foreign countries, and for help in the training of technologists to use them. This is a parallel to the technique of "train the overseas engineers of the future—they're your potential customers!" which has been applied so successfully by the larger firms of the electrical industry. Understandably, there have been demands from some quarters that Britain should match American intentions, and offer cash and training facilities in connection with costly nuclear equipment. In some ways, she may be better placed to do so than the U.S.A. It is not without significance that a former chairman of the U.S. Atomic Energy Commission has been complaining that American security regulations at present make it impossible to release useful information on power-producing reactors, as distinct from low-energy research designs. It may be that Britain can show herself less inhibited in this respect, and thus more helpful to the smaller nations who will want to make use of nuclear energy, though some restrictions seem to be placed on this possibility by the terms of latest U.K.-U.S. agreement. In any case, early attention is required if the opportunity is not to be let slip. Subject to possible difficulties of fuel supply, our traditional markets should be a minimum target for such potentially rewarding benevolence.

U.S. HOUSE HEATING

Home heating has not in the past been amongst the main domestic uses of electricity in the United States, largely because of the availability of competing fuels at low prices, and the accent on central heating. Recently, however, there have been signs of growing interest in this load. It is interesting to note that the Planning and Operating Engineering Manager of the giant American Gas and Electric Service Corporation, in his exclusive article that begins opposite, gives home heating a significant place in the upward surge of use that may carry average annual home consumption in the U.S.A. to 7,820 kWh by 1970. It is particularly noteworthy that the simplicity and low first cost of radiant electric fires are sufficiently effective to bring more and more of these into use, in spite of familiar doubts about their efficiency. The saving in cost of house construction made possible in comparison with central heating seem to be proving a powerful argument in their favour. More technical interest, however, attaches to the other main heating development, the heat pump which offers air conditioning as well as space warming. Many over here will be surprised to hear that fewer than 3,000 dwellings in the U.S.A. are yet equipped: but it is clear that the American supply authority enthusiasm which had led us to expect more will carry on from this start to more satisfactory totals when design details have been improved. In one form or another, electricity supply is now sure of a marked increase in the share it takes of keeping American homes warm.

DROPS FOR CONDENSER EFFICIENCY

Reduction in the size of condensers for turbo-alternators, and a corresponding fall in cooling water requirements are benefits which may come from work described in the latest report of the D.S.I.R. Mechanical Engineering Research Laboratory. The tubes of a condenser are usually covered largely with a thin film of water: only in patches does the condensed steam remain as separate drops. It has been known for some time that the film of water acts as a heat insulator, and that considerable increases in effectiveness would follow an extension of the "dropwise" mode of condensation. Equally, the way to achieving this was apparent—a water repellent substance would have to be present on the surface of the condenser tubes. The difficulty has lain previously in achieving the firm attachment of this repellent substance, so that it is not quickly washed away by the steam. Obtaining a solution to this problem has led Queen Mary College of London University (better known to the electrical industry for its high voltage work, and here working under a D.S.I.R. contract) into some new by-ways of chemical synthesis. The result has been the preparation of 100 or so new water-repellent substances which will actually attach themselves by chemical forces to the copper or brass of the condenser tubes. Laboratory work has now given way to field trials, and some months of successful operation of one of these compounds in a power station and in a ship are on record. Although longer tests than this will be needed before the development can be fully endorsed, the outlook for a significant advance in condenser design is clearly promising.

TOP TWENTY EFFICIENCIES

Average efficiency of British Electricity Authority power stations was 23·85% during the year ended 31st March, 1955, against 23·40% for the previous year, an improvement giving a 1·9% reduction in fuel requirements. This is a good performance to round off the set of statistics which will be associated with the B.E.A. As usual, the announcement of this average (rather belated this year) is accompanied by a list of the top twenty stations, which is reproduced elsewhere in this issue: and here two features stand out. The first is the absence of new names in the top half of the table: the first 10 stations are the same as for 1953-54, with only minor changes in their order of merit. More satisfying is the successful use of the more efficient stations to the best effect. Something over one-quarter of the total supply of electricity for the twelvemonth came from the best twenty stations, and so this was generated at an average efficiency of 28·74%.

Meteor

H. P. ST. CLAIR.
Planning and Operating Engineering Manager.
American Gas and Electric Corpn.
New York, N.Y.

Forecast of Power Generation in the U.S.A.

IT is always a risky business to undertake a forecast of future events or conditions in any field of human activity. Forecasting in the field of electric power generation is no exception, although some of us closely engaged in this business may feel some special confidence in our ability to prophesy in this field, particularly within a ten-year span. In any event, having witnessed the tremendous growth of electric power generation over the past three or four decades, we are, to say the least, firmly optimistic that heavy growth will continue for quite a long time in the future.

While it is not enough merely to determine past trends and project them into the future, nevertheless an examination of past performance is a good starting point for any forecast. To begin with, let us examine the growth over the past three-and-one-half decades in total kilowatthour production for the United States. As shown in Fig. 1, this has increased from an annual production of 56·6 billion (10^9) kWh in 1920 to some 545 billion kWh in 1954. This represents an increase of nearly 10-fold, or an annual rate of growth of 6·89% for the entire period. For the 15-year period from 1939 to 1954, the rate of increase is even higher, or 8·45% per year. There is also plotted on the same chart the annual production in the electric utility industry alone, showing an increase from 39·4 billion kWh in 1920 to 471·6 billion kWh in 1954. This rate of increase is higher than that for total production and indicates a trend toward purchased power in industry as against private power generation.

In making a projection based entirely on past trends, we can choose either one or both of these two figures for rate of growth, one over the entire period from 1920 to 1954, and the other over the shorter period, from 1939 only. Both of these have been added to Fig. 1, extending the curve on two different slopes, giving us the two figures for 1968 total production of 1,385 billion kWh and 1,700 billion kWh respectively.

Having made these two projections, we could choose one or the other, or perhaps an average of the two, and say that this is our forecast. However, we need to do more than that. We need to examine the basis for past growth and see if we can find substantial resasons for its continuation.

Correlated Factors

Looking back again, it is of interest to compare growth of electric power generation with other components of our economy, including population growth. This has been done in Fig. 2, showing 1920 to 1954 growth of steel, fuel, population, Gross National Product (in terms of 1920 dollars), all compared with electric power production. It is evident here that while steel, fuel, Gross National Product and even population have climbed at consistent rates, with 1954 levels varying only between 150% and 265%

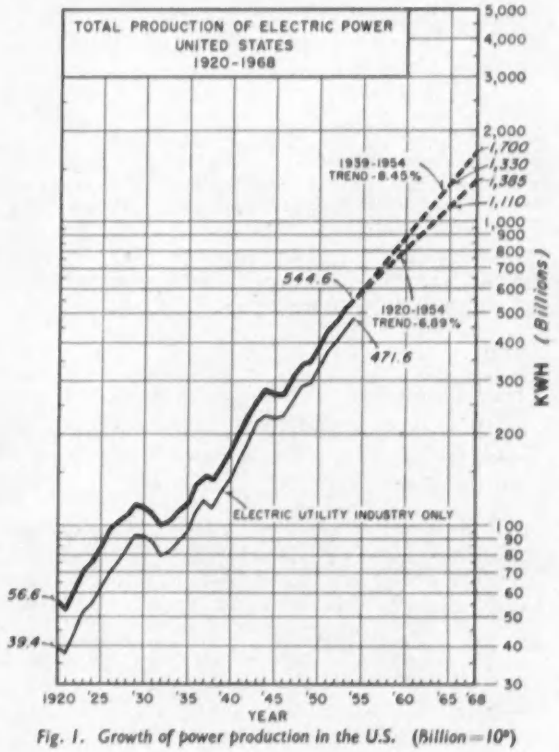


Fig. 1. Growth of power production in the U.S. (Billion = 10^9)

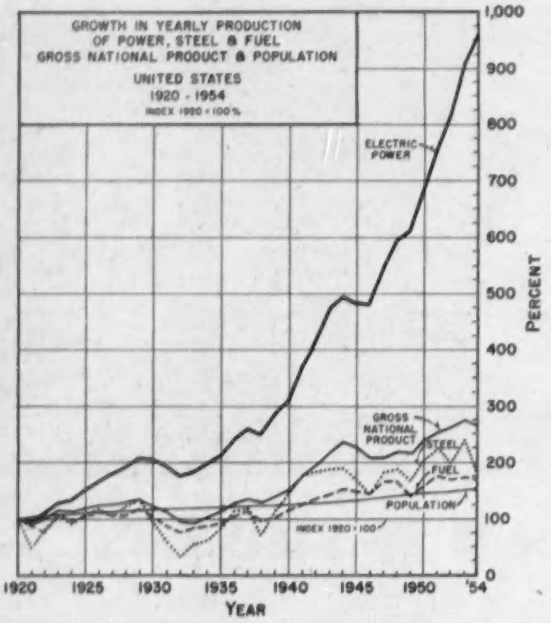


Fig. 2. Industrial and population growth compared with the yearly production of electric power. (1920 index taken as 100%)

Fig 3. Gross national product compared with utility electricity production. (1929 index taken as 100%)

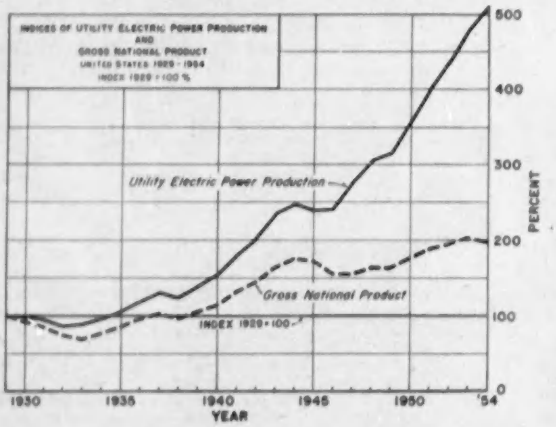


TABLE 1. FORECAST OF POPULATION, RESIDENTIAL CUSTOMERS, HEAT PUMPS IN SERVICE AND THEIR EFFECT ON AVERAGE RESIDENTIAL CONSUMPTION (JUNE 1955).

Year	*Total U.S. Population (Millions)	Average Number Residential Customers All Utilities (Millions)	Average Residential Usage Conservative (Kwh)	Optimistic (Kwh)
1953	159·6	41·3	2,345	
1954	161·3	41·8	2,540	
1955	163·2	42·4	2,740	2,740
1960	171·2	44·8	3,610	3,630
1965	178·0	47·0	4,960	5,350
1970	185·0	50·0	6,860	7,820

*1953–1960 Population—Median Forecast—Dept. of Census.

of 1920 levels, electric power production has sky-rocketed to almost 1,000% of the 1920 level. While the similarity in pattern between the curves of Gross National Product and electric power production can be seen in Fig. 2, this similarity is even more noticeable in Fig. 3 where these two quantities are plotted for the shorter period from 1929 to 1954. Both of these charts, therefore, show the remarkable growth of electric power usage as compared with other major components of our overall economy.

Now the question is, how can we establish some basis other than simple extrapolation for projecting our past record of growth into the future? As a starter we need to break down total power usage into a number of categories, and to examine each of these more closely to discover, if possible, some of the reasons for past growth. By the same process we may be able to forecast more accurately how these individual components can be expected to grow in the future.

Residential Use

One of the important individual categories is residential use of electric power. Fig. 4 we have plotted the growth of average residential use from 1930 through 1954 along with certain other trends which, we believe, have had a significant bearing on this growth in the past and which may be expected to exert an important influence in the future. As shown on this chart, average residential use increased from 547 kWh in 1930 to 2,540 kWh in 1954, or some 460% of the 1930 figure. During the same period, total population increased from 123 millions to 159 millions, or 125% of the 1930 population. Examination of the three lower curves, it is believed, will reveal two other significant factors in the rise of residential use. The lowest curve shows the actual downward trend in unit cost of electric energy, which dropped from 6·03 cents in 1930 to 2·69 cents in 1954, or only 45% of the 1930 cost. The other two curves show the declining availability of domestic help as evidenced by a reduction in the total number of people employed and an even greater reduction in the number *per capita*. These two factors together, —first the outstanding bargain that electric energy represents today, and second, the increasing necessity of providing electrical substitutes for domestic help—both tend to multiply the use of electricity in the home.

In addition to these general considerations, there are many specific reasons for optimism in forecasting increases in residential usage. The variety and versatility of electric appliances for use in the home is continually increasing. The rapid shift from radio receivers to conventional television receivers, accompanied by a substantial increase in power consumption, is certain to be followed, even if more slowly, by a shift to colour television with a further increase in power usage.

Heating the Home

Home heating by electricity is rapidly increasing in popularity and is being accomplished in two ways. The ideal system for year-round heating and air-conditioning is, of course, the heat pump. While progress to date has been slower than hoped for, with perhaps no more than 2,000 to 3,000 dwellings so equipped, it is being very actively promoted by both utilities and manufacturers and, with further improvements in efficiency and cost, it is fully expected that it will be accepted in sufficient volume over the next decade to make a substantial impact upon average residential usage.

The less efficient direct radiant resistance heating system, because of its simplicity and low first cost, is becoming increasingly popular, particularly in smaller homes. In spite

of its relatively greater power consumption, operating cost in well-insulated houses is not too burdensome, particularly in less rigorous latitudes, and the elimination of steam piping or hot-air ducts permits substantial saving in construction costs. Quite satisfactory air conditioning, if desired, can be provided by one or more relatively inexpensive window units.

In addition to the growing list of new home appliances, such well-established uses as electric cooking, refrigeration, water heating, automatic washing and drying, and many others, are still growing rapidly with a long way to go before reaching saturation.

A forecast of residential usage along with official population forecasts and average number of residential customers for all utilities is given in Table I. Here it will be observed that the 1954 figure of 2,540 kWh average residential usage is expected to increase, by a conservative forecast, to nearly double this amount, or 4,960 kWh by 1965, and to 6,860 kWh by 1970. A still higher forecast, based on an optimistic prediction of electric home heating and air conditioning, either with heat pumps or direct space heating, is given in the last column which shows 5,350 kWh for 1965 and 7,820 kWh for 1970.

While farm usage is sometimes considered as a separate classification it is really more realistic to consider it a special case of residential usage. While it is true that mechanisation on the farm has brought about tremendous increase in production with an even smaller amount of manpower, this mechanisation is principally of the mobile type, powered by gasoline or diesel fuel engines. Statistics show that the growth of electric power usage on farms has been about the same as the overall growth in residential usage and has accomplished about the same result, that is, making available to the farm home the same advantages of electrical living that are enjoyed by other homes.

Industrial Power

The largest category of electric energy consumption is undoubtedly the industrial power usage. It hardly needs to be pointed out that the levels of industrial production which have been achieved in the past and are being maintained and increased today could never have been brought about without continually increasing use of electric power. Some actual figures on relationships between total production, manhours of labour, and electric power consumption for the 33 years from 1920 through 1953 are given in Table 2. In the upper part of this table it is interesting to observe in the sixth column the steadily declining use of manhours of labour for each unit of the Federal Reserve Board Index of Manufacturing output during these years. On the same basis, the last column shows the rising trend of electric consumption for each unit.

The figures in the lower part of Table 2 are even more striking in pointing up the relationship between production per manhour and the use of electric power. Using 1939 figures as a base of 100%, the second and third columns show how the production per manhour has increased from 51·2% to 131·3% from 1920 to 1920 to 1953 and during the same period electric power consumption for each unit of physical output has increased from 55·4% to 123·2%, resulting in almost a direct relationship between these two quantities. The final column of Table 2 shows the kWh consumed per manhour in industry, which rose from 1·21 in 1920 to 6·94 in 1953, an increase of almost six-fold.

The direct conclusion from this is that electric power consumed in industry must continue to increase at a rate faster than actual physical output, not only to make it possible to increase production levels with available manpower, but also to offset the inflationary effect of a rising cost of labour. In other words, an increasing use of electric power is perhaps the first requirement in making progress toward a continually rising standard of living. It also goes without saying that it is an indispensable ingredient in our continuing defence effort which depends so completely upon our industrial machine.

The Overall Forecast

While our overall electric power consumption includes some other categories, those described above account for the major part of our total power usage. Having examined these principal components separately, we can now proceed to add them together to obtain an overall forecast which may be considered somewhat more trustworthy than the simple extrapolation shown in Fig. 1, even though the final result may not be very different. Thus, Table 3 brings together the various categories of energy consumed, including those discussed above, and shows actual figures for 1940, 1950 and 1954, with individual forecasts for 1960 and 1965. The "Residential" classification is based upon figures lying between the probable and optimistic columns of Table 1, while the industrial classification covered by both "Small Light and Power" and "Large Light and Power" is based upon the long-term trend for manufacturing consumption of 6·68%. Losses, which constitute a substantial item in the total, have been assumed to level off at 14½% in both the 1960 and 1965 columns following a reduction from the 19½% and 17·3% figures for 1940 and 1950 respectively. Electric power production outside the utility industry, classified as "Production for Self Use," has been projected at a modest rate of increase on the

TABLE 2. COMPARISON OF ELECTRIC ENERGY CONSUMPTION, PRODUCTION AND PRODUCTIVITY FOR ALL MANUFACTURING INDUSTRIES EXCEPT ALUMINIUM AND MAGNESIUM PRODUCTION (MAY 1955).

Year	Number of Production Workers	Total Man-Hours (Millions)	Av. Annual Man-Hours per Worker	FRB Index Mfgs.*	Million Man-Hours per FRB	Kilowatt Hours (Millions)	Million Kwh per FRB	Indices of Production† per Man-Hour (a)	Electricity Consumed per Unit of Production (b)	Kwh per Man-Hour
1920	8,529,000	21,024	2,465	39	539	25,533	655	51·2	55·4	1·21
1930	7,358,000	16,107	2,189	48	336	51,634	1,076	82·2	90·9	3·20
1939	8,192,000	15,753	1,923	57	276	67,621	1,186	100·0	100·0	4·30
1947	12,794,000	26,356	2,060	100	264	130,409	1,303	104·5	110·0	4·96
1948	12,717,000	26,006	2,045	103	252	144,603	1,404	109·5	118·7	5·56
1949	11,567,000	23,122	1,999	97	238	141,816	1,462	116·0	123·6	6·13
1950	12,264,000	25,337	2,066	113	224	164,248	1,454	123·1	122·9	6·50
1951	13,135,000	27,268	2,076	121	223	179,852	1,486	123·8	125·4	6·60
1952	13,144,000	27,287	2,076	125	218	183,020	1,464	126·7	123·8	6·70
1953	13,850,000	28,614	2,066	136	210	198,603	1,460	131·3	123·2	6·94

*Federal Reserve Board Index 1947–1949=100. †Production as measured by the FRB index of actual physical output. (a) Ratio of manhours per FRB index in 1939 to that in each year. (b) Ratio of kWhr per FRB index in each year to that of 1939. Source: E.E.I.

assumption that industries will be less likely to expand their own generation as against purchasing their power requirements from public utilities.

The final result obtained from this individual forecasting procedure gives us, as shown in Table 3, a 1965 total U.S. production of 1,110 billion kWh, which actually turns out to be a point on the lower projection of the Fig. 1 curve.

Generating Capacity

On the question of peak-load and generating-capacity requirements our discussion will be confined to the electric utility industry alone, excluding privately owned plants. Here again a good starting point will be a look at past performance. In Fig. 5 which shows generating capability and peak demands for the years 1920 to 1954, it is interesting to trace the effect of the boom years of the late '20s, and the subsequent depression years of the '30s, leading into the defence and war years which followed. The heavy drop in load taking place in the early '30s produced a decided bulge in the margin between generating capacity and load which was not restored to more normal proportions until the beginning of the defence period in 1938 and 1939. It is interesting to note also that while a fair margin of capacity was maintained throughout the war period, the sudden and unexpected rise in load during the post-war period beginning in 1946 resulted in an extremely tight capacity situation which in spite of unprecedented expansion in generating capacity was not substantially alleviated until 1952 and 1953.

Fig. 6 shows the same figures of peak load and capability plotted on semi-logarithmic co-ordinates from 1940 to 1954 and with capability extended through 1956, based upon generating capacity actually under construction. While no attempt has been made to project the capability curve beyond 1956, it may be assumed that an average margin of 15% or greater will be maintained throughout

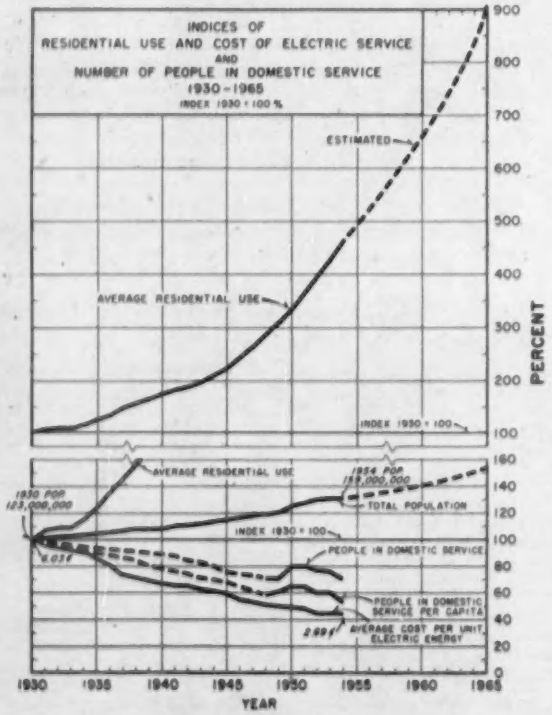


Fig. 4. The change in domestic factors is shown here

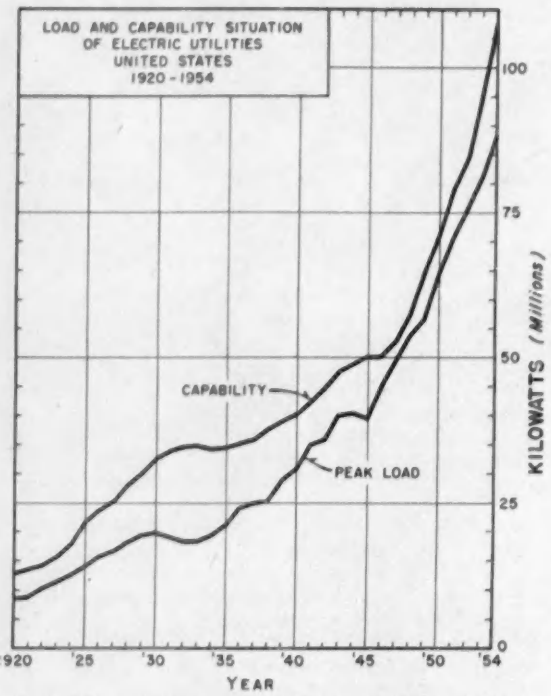


Fig. 5. Relationship between peak loading and capability of utilities

the succeeding years. The forecast of utility-industry peak loads has been based upon the kilowatthour production forecasts given in Table 3 as 730 billion kWh and 1,010 billion kWh for 1960 and 1965 respectively. These figures, combined with a load factor of 62·4%, as estimated from the recent trend of annual load factors, give estimated peaks of 133 million kW and 185 million kW for 1960 and 1965 respectively. The 225-million kW peak for 1968 was obtained as a straight-line projection from 1965.

Hydro and Steam

While considerable emphasis is often given to the development of hydro generation in the United States, and while the total capacity installed is a large figure, it needs to be pointed out that in terms of kWh generation, only 24% of the total utility industry production was obtained from hydro in 1953 and that this figure will continue to decline to an estimated figure of 19% by 1965. A substantial amount of additional hydro capacity remains to be developed, particularly in the northwest and Pacific Coast regions, but the major growth of electric power generation will come from steam-electric plants. In this connection it may be of interest to observe that in the TVA system, originally conceived as an exclusively hydro-electric system, the present division of installed generating capacity is already 66% steam and 34% hydro, with an even greater percentage of total kWh produced by steam.

Coal will continue as the predominating fuel for steam-electric plants, providing for some 60% to 65% of the total energy, with oil and gas accounting for the remaining 35% to 40%. Taking into account the expected increase in average efficiency, the total coal requirements for the electric utility industry are expected to increase from the 1954 figure of 118 million tons, to 168 million and 209 million tons in 1960 and 1965 respectively.

Generator and Boiler Size

This discussion of future generation of electric power in the United States would not be complete without at least

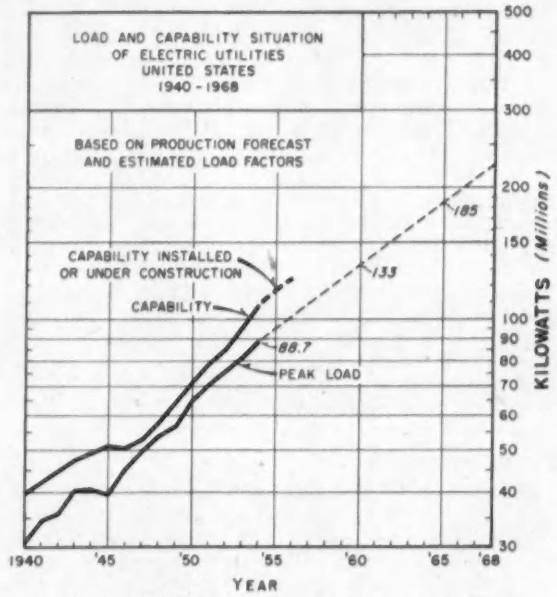


Fig. 6. Extrapolation on a semi-logarithmic scale of peak load

a brief reference to past and future progress in terms of size of generator and boiler units, advances in steam temperatures and pressures, and improvements in thermal efficiencies. As indicated rather strikingly in Fig. 5, generating capacity has been installed at a very high rate from 1946 to the present date. While this growth includes all utility systems both large and small and therefore a wide range of unit sizes, it is of interest to give some idea of the prevailing trend in sizes of units among the larger utility companies where such units can be utilised. This has been done for eleven of the major utility systems, including the Tennessee Valley Authority, and the figures are plotted in Fig. 7. The cumulative growth of capacity for the United States is shown in one curve while a second curve shows the average size of unit installed by the eleven companies in each of the years from 1946 to 1954. This average ranges from about 58,000 kW in 1946 to a value of 152,000 kW in 1954. At the same time a third curve indicates the maximum unit size installed in each year during the same period and this increases from 65,000 kW in 1946 to 215,000 kW in 1954. It should be noted, however, that the 1946 installation was not typical for that period as units of much larger size had been installed in previous years. As to future sizes, units of 300,000 kW have already been announced and it may be expected that within the next 10 years even larger units up to 400,000 kW, will be under way.

Temperature and Pressure

Progress in pressure and temperature is illustrated in the chart on Fig. 8, the upper portion of which shows the gradual increase in steam temperatures from a maximum of 760° F. in 1930 to 1,150° F. in 1954. Pressures in 1930 had reached 1,250 lbs. psi and by 1954 had just about doubled to 2,400 lbs. psi. In this curve it will be noted also that 1954 marks the first break in pressures into the super-critical area with the undertaking of the 4,500 lbs. psi unit being built by the General Electric Company for the American Gas and Electric Company at the Philo Plant. There has since been announced an even larger super-critical unit to be built by Westinghouse for the Philadelphia Electric Company with steam conditions of 5,000 lbs. p.s.i. and a set of 275,000 kW capacity.

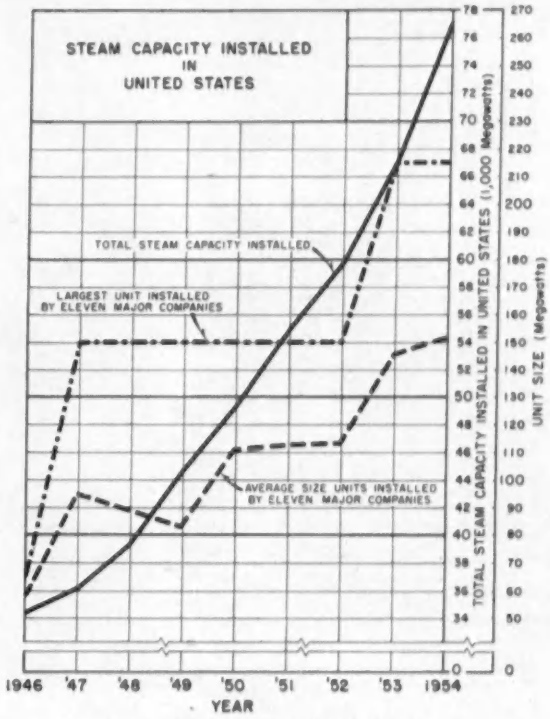
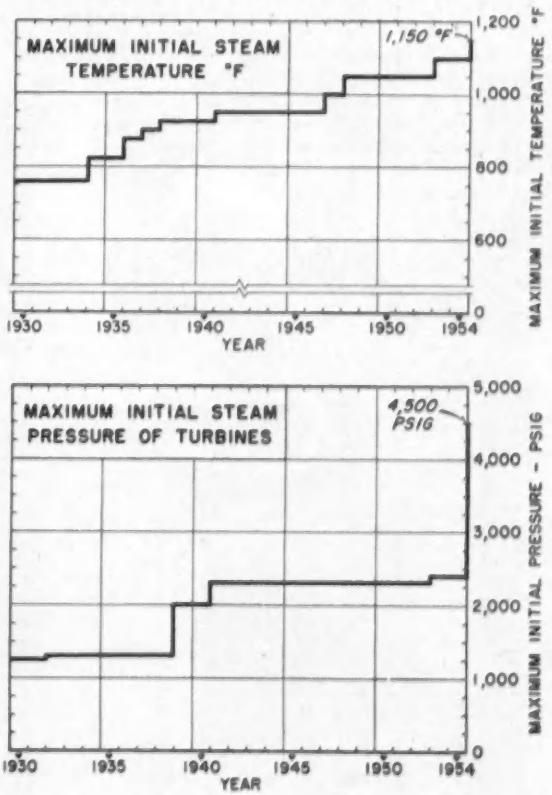


Fig. 7. Unit size and total steam capacity

Fig. 8. The climb in pressure and temperature



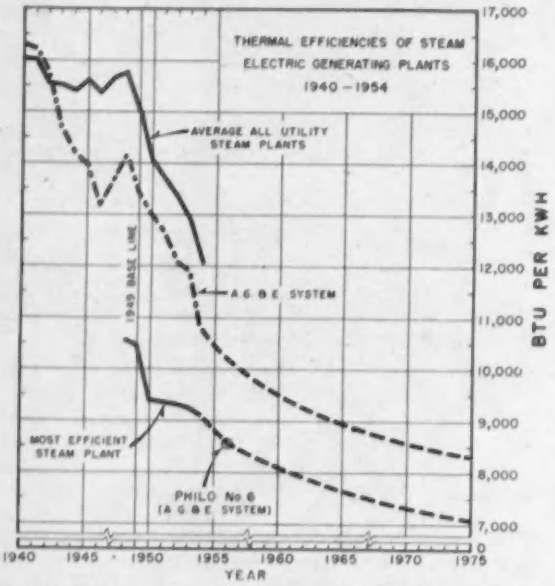


Fig. 9. Thermal efficiency of steam plants. The most efficient stations were:—1948, Port Washington (Winsconsin Electric Power Co.), 10,588 BThU/kWh; 1949, Sewaren (Public Service Electric and Gas Co.) 10,437 BThU/kWh; 1950, Philip Sporn (A.G. and E.), 9,378 BThU/kWh; 1951, Tanners Creek, (A.G. and E.), 9,354 BThU/kWh; 1952, Tanners Creek, (A.G. and E.), 9,303 BThU/kWh; 1953, Kanawha River (A.G. and E.), 9,249 BThU/kWh; and 1954, Kanawha River (A.G. and E.) 9,099 BThU/kWh

Mention was made in connection with future coal requirements for the electric utility industry that these future estimates took into account expectations of improved efficiencies. In this connection it is of interest to examine the progress that has been made in thermal efficiencies of steam-electric generating plants over the past 15 years and to attempt a prediction of what may be possible in the future. This has been done in Fig. 9, which shows the average B.T.U. rate of all utilities and plants from 1940 to 1954 and in addition the rate for the most efficient plant for the period 1948 to 1954. The data on which the latter curve was plotted is given in the list of most efficient steam plants shown on the right-hand side of this chart, from which it may be noted that from 1950 through 1954 American Gas and Electricity System plants held the record for efficiency. The next point on the curve is the 8,600 B.T.U. rate calculated for the Philo unit to be completed in 1956 and from there it is expected that further advances at super-critical pressures and higher temperatures may eventually bring out heat rates approaching 7,000 B.T.U.'s per kWh, possibly by 1975.

The middle curve of Fig. 9 shows the average B.T.U. performance of all plants on the American Gas and Electric Company System as an interesting comparison with the average of all utility steam plants. The sudden rise in heat rate shown on this curve between 1946 and 1949, which is duplicated to a lesser extent in the top curve for the overall average, resulted directly from the tight capacity situation during this period, as reflected in Fig. 5, when it was necessary to operate many of the smaller inefficient plants to meet the load. Many of these plants are now completely retired and dismantled.

Nuclear Projects

At this time, no discussion of electric power generation over the next 10 years for either Great Britain or the United States would be complete without some mention of the possible role of nuclear power generation. While space will not permit any detailed discussion, it may be pointed out that although several plants are expected to be in operation by 1960, the total capability in relation to the overall generating capacity in the United States will certainly be very small. By 1965, if developments proceed as rapidly as it is now hoped, the number of plants and the aggregate amount of generating capacity involved will be considerably more, but probably even then a relatively small percentage of total capacity. On the other hand, it may be said that progress in nuclear power developments has exceeded earlier expectations so that our present predictions may be somewhat on the conservative side. In any event, however, it cannot be assumed that within the next 10 years nuclear power will constitute a really significant percentage of our total generating capacity. As indicated in Fig. 9, further substantial improvements in thermal efficiencies of coal-burning plants are anticipated and there is no expectation at this time that the development of nuclear power plants will materially retard continued development of large-capacity, highly-efficient conventional fuel-burning plants, particularly in areas where relatively low-cost fuels are available.

(The data given in Figs. 1, 2, 4, 5 and 6, were derived from the Edison Electric Institute, the U.S. Department of Commerce and the Bituminous Coal Institute.)

TABLE 3. FORECAST OF ELECTRIC ENERGY CONSUMPTION BY VARIOUS CLASSES OF CUSTOMERS (MAY 1955).

Classification	Actual		Millions of Kilowatt-Hours	Forecast	
	1940	1950	1954	1960	1965
Residential or Domestic ...	23,318	67,030	108,465	164,200	237,100
Rural	1,991	7,400	10,176	17,200	24,700
Small Light and Power	22,373	50,446	73,373	116,000	158,000
Large Light and Power	59,557	139,065	200,155	312,000	424,000
Street and Highway Lighting ...	2,048	2,976	4,042	5,400	6,600
Other Public Authorities ...	2,720	7,163	9,423	17,900	26,500
Electric Traction	5,909	5,882	4,701	4,600	4,500
Interdepartmental	727	578	569	600	600
Total Utility Sales	118,643	280,540	410,904	637,900	882,000
Losses	23,194	48,601	60,705	92,100	128,000
Total Utility Production ...	141,837	329,141	471,609	730,000	1,010,000
Production for Self Use* ...	38,100	59,533	73,036	80,000	100,000
Total U.S. Production	179,937	388,674	544,645	810,000	1,110,000

*Includes Industries, Mines and Railway Power Plants.

Materials for Nuclear Power

Work at the Culcheth Laboratories A.E.A. (I.G.)

IT is now generally realised that progress toward the goal of nuclear power is mainly dependent on the development of suitable materials to stand up to the onerous physical and chemical duties imposed by the handling of big radio-active substances at high temperatures and pressures. Research and development is currently being carried within the Industrial Group of the United Kingdom Atomic Energy Authority by five sections located at Springfields, Windscale, Capenhurst, Risley and Culcheth. A further section is in course of formation at Dounreay site. Of these laboratories, the one at Culcheth, near Warrington, deals with problems of the selection of materials. It is associated closely with the Engineering Design Branch at Risley, and, owing to the comparatively small scale of the work the hazards due to toxicity are a minimum, the only protection required being the wearing of overalls.

The small scale work at Culcheth is extended to a larger scale at the Springfields laboratory which is responsible for the development of fuel and fuel elements. At Capenhurst, the work is directed to problems of an engineering nature concerning fluid flow, heat transfer and others arising from the design of reactors, while at Windscale, the laboratories are largely devoted to hot radioactive chemistry, metallurgy and physics arising from the pile problems at Windscale and Calder, and chemical problems associated with the plutonium separation process.

Metals

The recent relaxation in classification has permitted the work being carried out at Culcheth to be shown publicly and we were privileged to visit the laboratories last week.

Much of the work was devoted to the production of metals and alloys and to full investigation of their physical and chemical characteristics. When uranium is irradiated it undergoes dimensional changes which may impose stresses on the container. In addition, thermal cycling also produces stresses. The containers, have, however, to possess other properties including small capture cross sections for neutrons in thermal reactors, and although in the fast reactors this is not so important, the temperature problem then becomes acute. The most desirable elements for the first thermal reactor are aluminium, beryllium, magnesium and zirconium. In the second class are the refractory transition metals such as titanium, zirconium, vanadium, niobium, tantalum and molybdenum, tungsten and rhenium. The extraction of these metals in the purest possible form in the most economic manner is a problem exercising the laboratory. One of the results of this work has been the production for the first time of vanadium and niobium in a ductile form. Techniques have been devised for the fabrication of these materials and determinations made of their physical and mechanical properties. The reaction between uranium and certain metals or alloys is under investigation, as are also the properties of the various liquid alkali metals which may be called upon to act as coolants.

The techniques used in the laboratory are fundamentally similar to those utilised in normal analysis and separation except that they are carried to temperatures and pressures well outside the usual range. There also exists a section which is devoted to inspection and test and this acts as a works metallurgical laboratory for some sections of the Industrial Group.

Speaking at the visit, Dr A. B. McIntosh emphasised the importance of work on nuclear equipment, and spoke of the requirement for young and enthusiastic scientists and technologists to undertake the solution of problems in this new, interesting and satisfying field of development.

One of the laboratories at Culcheth engaged in work on powder metallurgy for reactor materials

The Laundry Load

—is there a limit?

Modern laundry appliance design in Britain now offers complete automatic operation from wash-tub to final storage

asks MARY GILBERT
(British Electrical Development Association)

OF all fields of electrical selling, the home laundry would seem to be the most spectacular in terms of saving woman power. And—never has the need for conserving energy on the home side been so important as it is now. Nationally, it is an economic problem.

Close on seven-and-a-half million women in Britain now are in full-time employment, and a large proportion of these with their own homes to run. The need for simplification in home routines is urgent, and essentially this is electricity's job. But are we seizing the opportunity for promotion of the right ideas to convince the public?

To get going, it invariably helps to watch others tackling a similar idea. How does America, the sales conscious country react to the problem? Of their 50 million families, 10 million wives hold jobs outside the home, so appeal on time-saving lines is primarily directed to the two-part wife. From a recent survey, however, it emerges that both working wives and full-time housewives (socially- and club-minded) own a refrigerator and a washer, in addition to the more widely held subsidiary appliances. In addition, it is heartening to note that all the "average housewives" laundry in the U.S. is done at home by electric washer, though fewer of them at present have electric dryers and ironers; so for millions the electric iron and ironing board still operate. Here are the U.S. figures at end 1954:

Of 44,787,000 *wired homes*—36,418,000 own electric washers. *Saturation* .. .. .. 81·3%
2,967,000 own automatic dryers .. .. 6·6%
4,144,000 own ironers .. .. .. 9·3%

And—the British figures—

Of 12,658,519 wired homes—4,898,000 own electric washing units—washers and washboilers 38% app.

(Automatic dryers and ironers are too recently developed for representative figures to be available.)

Beyond the fact that sales potential, on population in the U.S., is roughly three times higher than our own, what is so different in our living patterns that we cannot materially catch up our saturations? Let us look at the factors governing washer sales first, recognising that the washer is the wedge that prises open the door for full-scale laundry sales.

Water Supply

Commenting on the still-healthy market for non-automatic washers in the States—ratio now is one to every two "automatics" sold—a U.S. publication quotes one probable reason (apart from price tag) for non-automatic washer choice as being the absence of running water, water shortage, or insufficient supplies of hot water.

In the follow-on is quoted—"There are millions of homemakers in the United States labouring under one or more of these handicaps." Nevertheless, "these handicaps" by no means stopped the sales of 1,230,000 conventional-type washers (wringer or spinner types) throughout the 48 States last year!

In Britain, as we learnt recently from figures of 1951 Census advance reports, there are 690,000 households in Britain, (17% of homes) with no piped water. Yet even these potential consumers (like their American counterparts, often located in country areas) join their more fortunate neighbours via the electric pump and rural electricity schemes, and can be counted as suitable recipients of promotional literature, and probable visitors to our stands at agricultural shows.

While on the subject of piped water and the hot water supply, coming promotions for the domestic heat pump should be highly effective when related to laundry needs. Apart from the advantage of a daily yield of about 120 gallons of hot water at 140° F. (of which about 20 gallons would meet the family washer's demands) there is also a mental tug-of-war in women's minds to contend with on the priority of refrigerator over washer for the home. When the heat pump provides plentiful hot water, "conditioning" the larder at the same time—the washer wins!

Prejudice

Dissolving the hard core of certain British attitudes toward labour saving as such, is vital ground-clearing

Laundry appliance design for the home market covers a wide field from the fully automatic washer to the smallest flatlet model of 3½ lb capacity (Figs. 1, 2, 3, 4). Equally accommodating to modern living conditions are the drying appliances (Figs. 6, 7 and 9) varying from a "folding suitcase" or spin dryer to the highly styled tumbler dryer of transatlantic tradition. Ironing—preferably a sit-down occupation—is fully catered for by the rotary attachment or free-standing unit (Figs. 5 and 8)

before large-scale promotions get going. Just how deep-rooted are some of these prejudices only an occasional encounter brings to light.

Reminder came forcibly to me this spring, at the visit of an American editor friend of mine, who came to cover the habilitation of U.S. service wives on station in this country. She referred to me with natural astonishment, for some comment on the reactions she had met when gathering her stories.

"Oh you Americans, you can't live without your gadgets" was often the greeting, as afternoon tea had been followed by the British wife's visit to a normally equipped U.S. kitchen—brought over to the new home here. This attitude was tending to sap spontaneity and restrict ripening friendships. Naturally, I quoted some of our national problems which, for some years, had retarded general post-war ownership of similar units, though the desire for ownership had been there, adding some picture of now-mounting sales. This adjusted focus a little on the differing viewpoints.

Here, again, was the hidden prejudice peeping behind the British wife's retort, and we would be wise to recognise and reckon for this mental resistance in some quarters, where an almost puritanical attitude breeds the belief that there is actual virtue in doing things the hard way. Now that the money is there, it does not emanate entirely from "the one who pays"—Father!

Size of Kitchen and Family Needs

A subsidiary factor to overcome in selling washing equipment, is the current fallacy that "four-person-and-over" families must have a big-capacity washer, but are deprived on restricted kitchen dimensions. As soon as Monday-mindedness is dispelled with the consumer public by commonsense approaches, and flexibility in relation to the workability of smaller models established generally, we surely will find ourselves on a steeper sales curve. Splitting loads in the smaller model, though not ideal for a larger family, at least staggers finishing in restricted space, saves heavy inroads on hot water, and, where drying space is equally limited, maintains normality and freedom from the inconvenience of all-pervading dampness. (But the newer drying equipment settles that.) Always, we must keep the working wife and her needs before us.

Washer Design Today

Where America goes in for the "automatic" and semi-automatic models in a big way (many with water-saving devices) home sales of these types in U.S. last year totalling 2,420,000—Britain still places her market largely on conventional designs. Toward the end of last year, a monthly average sales figure of approximately 50,000 proves the demand. To the smaller capacity model, with hand wringer, must go the credit for "making" the market in Britain, on a 3½ lb load. But evolution in size of tub and type of water turbulence adopted in manufacturers' designs, now often results in several sizes being available from the same stable, thus appealing to every family need and kitchen dimension.

Approximately twenty-four firms, producing between them 48 models, now compete for the home market, with models ranging from the fully automatic (Bendix), Semi-Automatic (Thor/Parnall) to the Conventional (agitator). Those taking 7–9 lb. loads include Ada, Burco, English Electric, Fisher, General Electric, Hotpoint, Summerscales, Taylor and Wilson, Thor/Parnall, Universal Boilers, and Wilkins and Mitchell. To meet the demand for acceleration in heating water, or the occasional boil, heating loads varying from 2–3 kW are offered in some of these models. Powered wringers are fitted for the larger-load machines.

For the smaller home and family, machines varying in load from 3½ up to 6 lb sell rapidly. These models include those produced by Ada, B.V.C., Burco, Clegg and Coupe, Co-operative Wholesale Society, Cotto Products, Easiclene, Entwistle and Kenyon, H. Fisher Ltd., Hoover Ltd., Longford Electric Ltd., Universal Boilers, Wilkins and Mitchell, and Wonder Washing Machine Co. In some cases, these models also include heating facilities, and a few offer powered wringers as well. (Not included here are names of manufacturers offering sink conversion units, sonic washers, or separate units intended for mounting on boiling plates or heating surfaces.)

Prices range from "Automatic" at £103. 6s. 9d. (with tax) to more conventional models that start from £29. 15s. to reach over £100 when special attachments are included. An average price would be around £60 with tax. On present hire purchase agreements, conditions are good.

There is also a growing trend for kitchen planning firms to develop electric washer-sink units as standard fitments. These help to popularise the "fitted" laundry line.

Dryer Designs

Here Britain is developing her own pattern, adjusted to the restricted space of family living. America is busy developing her "Wash-and-Dry" techniques, either in twin units with "automatic" and tumbler dryer, in side-by-side setting, or by the latest trend (now adopted by three U.S. manufacturers) of "Wash-and-Dry" (two-in-one) machines When the wash is through the cycles of "wash" and "rinse" —a three-way "dry" dial, providing a choice of three degrees of drying pace, continues the treatment, without removal of clothes until they are actually ready for ironing.

There is also a busy U.S. market for washers with built-in spin dryers, to take over as the new load starts up. This way, on assembly line principles, a full family wash-and-dry goes through in an hour. Here is home automation indeed.

Already Britain has one tumbler-dryer of U.S. pattern, to partner the higher load machine. Tailored to fit the smaller home is a wide range of cabinet dryers; also portable dryer units and heater converters, each type appealing either to the small home or flat. Latterly, in the past eighteen months, the free-standing spin dryer has appeared. This unit—when operating at 2,200 r.p.m., is capable of removing moisture to within 50% of the original dry weight for cottons and linens; and within 7% for rayons and other man-made fibres. Of suitable size for stowing into a cupboard in the kitchen after wash-day service, these units vary in price from £34–£40, including tax.

Ironers

The free-standing ironer—both flat-press and rotary—is now introduced in Britain, two designs for each being available. Prices of flat-press are about £29–£30, and the rotary from £35–40. The rotary ironer attachment for the family-size washing machine is proving the biggest pull. Average price here being £29–£30. Six makers of machines offer this attachment. As in the U.S. there remains a big field for development here.

Promotions

If the electric laundry is to achieve the importance in public mind of the foot-tied appliances—cooker/refrigerator—prestige planning becomes essential. We have to admit that the load is important, and worth winning. To the manufacturer—higher sales are vital. It is to the

interest of all that laundry planning should assume the same importance as kitchen planning, and ways should be evolved at the point of sale for bringing forward into prominence the "Laundry Line" as a *continuous scheme*—not just to stimulate the sale of a washer. A national effort is needed.

Consumer Research

Sometimes "consumer research" seems a large term for very little, but it can mean "the earth." Forgive another U.S. quote, but there they see fit to organise for the whole thing, on joint presentation basis. Not only is there an American Home Laundry Manufacturers' Association, for the issue of promotional literature, and the stimulation of public consciousness in the three-fold appliance uses—washer-dryer-ironer—but annually (for the past eight years) they hold a vast convention attended by everyone in the least degree involved—including home economists and home editors of magazines. The 9th Convention—to be held in San Francisco—comes in November. They seem to have got something there.

Out of an Association of this kind in Britain much can grow. Home service, advice, literature, even a Women's Association—a "Home Laundry League"—offering practical guidance, lectures in showrooms, fabric advice on latest research and laundry management planning and help—would not be beyond us in Britain, once organised from the top. It also would prove a grand prejudice reducer on a long term basis!

Personal service has a big pull with the public—and where laundrywork is concerned, so has the personal wardrobe. Food may be first selling class—but clothes come a good second.

By the way—is anyone thinking of San Francisco next November?

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Early Wiring H.P.

I HAVE been very interested in Megohm's contribution to your current issue but am inclined to think he is just a little behind the times when he writes about hire purchase or instalment payments for wiring and am sending you this letter to inform him what was done many years ago.

I claim to be the first contractor who carried out wiring on the Easy Payment system, and I inaugurated the scheme thirty years ago. My advertised terms were 20% down and then 1s. per light per week till paid for. These terms were not binding and I amended them to suit individual requirements and especially when lighting and heating plugs were required. Of course, I must tell you that the scheme was not applicable to everybody, but to owner-occupiers only, as it would have been foolish to risk my money on tenants who could and probably would have left me in the lurch.

Apart from light wiring I found that if plugs were installed the customers remained on my books sometimes for years for the simple reason that just before the final payment for the wiring was made an iron was wanted, then a kettle, radiator, etc., and whatever it was the usual weekly payments carried on. As all these additional pieces of apparatus were supplied to be paid for on easy terms. 10% was added to the retail price and I never once had any objection raised to the additional shillings which they were always told about when deciding on the article. The same thing applied to any extra or special bowl fittings or 3-light electroliers which I often supplied a year or more after the original installation was put in.

I had no complications arise over payment of accounts as I always insisted on payment being made at my shop and I never had to send or call for a payment. There were odd cases that arose when illness overtook a husband, but I always had a call on "pay-day" by the wife to notify me she couldn't pay. After making an inquiry about the illness or accident I often said don't trouble to come again for say, six or eight weeks and then call and let me know how the patient is progressing.

If necessary, I again extended the time but generally I got two or three weeks payment down if the husband had recovered and got back to work.

Generally speaking, owner-occupiers are proud people and do their best to pay off their debts as early as possible.

This scheme brought me in a lot of business and it was not very long before the Bradford Corporation copied my scheme but altered the terms. The Corporation terms were £2 down and sixteen quarterly payments and this scheme was put into operation in 1927.

I hope this historical note will be of interest, not only to Megohm but to very many of your readers especially those who are interested in hire purchase or easy payment business.

Harry Moss, M.I.E.E.,
BRADFORD.

Wiring in T.R.S.

THE contribution of H.M. in your issue of 28th April, "Domestic Installations," interested me, but surely the poor workmanship your contributor has encountered on this housing estate could have been avoided if these installations had been inspected and tested by an efficient installation inspector, who insisted that the work be carried out to I.E.E. Regulations before supply would be connected. The t.r.s. and p.v.c. cables in roof spaces run over joists seems to be common practice in Great Britain and I agree with H.M. that it is inviting anyone to walk on these cables.

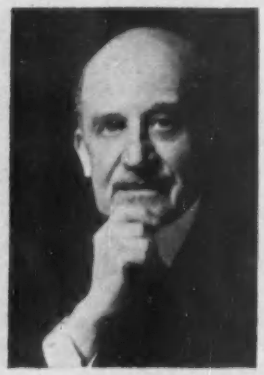
Here in Australia the Standards Association of Australia, whose Wiring Rules are governed by that body in Queensland and New South Wales, etc., state that t.r.s. and p.v.c. cables run in roof spaces where not parallel with joists must be attached to the sides of wooden battens not smaller than one inch square, at intervals of not less than two feet, and where run parallel with joists the cable shall be attached to the sides of the joists, or else shall be laid directly on the ceiling beside the joists, in such cases the fixing shall not be more than six feet apart.

These days there are quite a lot of cheap jack merchants calling themselves electricians and getting contracts, but I feel sure these could be made to toe the line as regards new installations if the Inspector does his job right.

Arthur Dearden,
BRISBANE, QUEENSLAND, AUSTRALIA.

British Electrical Power Convention

BRIGHTON at its most gay, bathed in glorious sunshine, welcomed delegates and visitors to this year's Power Convention. As a prelude to the Convention proper, Monday saw the traditional C.E.A. private meeting with sessions both in the morning and afternoon. Other delegates took the opportunity of the free day to tour the Exhibition, possibly contemplating the rumour that Torquay is a likely venue for the 1956 B.E.P.C., while the possibility of this being held at a quite different time of year may not be discounted. Later in the day the Exhibition became well attended for the opening performed by Sir Harry Railing. In pointing out the suitability of Brighton as a Convention town he made specific reference to the Mayor and the Corporation, thanking them for their co-operation which was so amply evident. He then went on to pay a tribute to others who had worked toward making the Exhibition such a galaxy of examples of the industry's contribution to an easier life. To conclude the evening, Mr S. F. Steward, who had introduced Sir Harry, presented Lady Railing with a handsome leather writing case as a memento of the occasion.



Sir Harry Railing, D.Eng., Hon. M.I.E.E.

Tuesday's proceedings opened with a Civic Welcome accorded by the Mayor of Brighton, Alderman J. A. Trevelyan Leak, J.P., who was introduced by the President. In contrast to Brighton's chief citizen when last the Convention was held in the town, Alderman Leak has had a long association with the gas industry. But in wishing the Convention success, he expressed his confidence that the present peaceful co-existence of the two fuel industries would continue in service to the consumer. Then the Convention proper began with the Presidential Address.

The President

Sir Harry Railing, the second of the British Electrical Power Convention's Presidents to be drawn from manufacturing industry, gained his early training in engineering on the Continent and in the United States. His life's work, however, has been in Great Britain with the General Electric Co. He joined the company 50 years ago, and has been largely responsible for the remarkable developments that have occurred in its heavy engineering activities.

Sir Harry's first appointment with G.E.C. was in 1905, when he took charge of the test department and laboratories at Witton Works. Six years later he was placed in charge of the engineering works, and when he left over 20 years later the works had extended tenfold. Sir Harry went to the headquarters of G.E.C. in 1933, by which time he was a director of several of the company's subsidiaries. After that his progress in the ranks of higher management was rapid. He became joint general manager in 1941, vice-chairman in 1942 and in 1943 he was elected chairman and joint managing director.

In spite of demands made by this period of great development within his organisation, Sir Harry has been consistently active in the professional and trade associations with which the electrical industry abounds. His chairmanship of the B.E.P.C. is a late addition to many similar offices he has held. He was chairman of the I.E.E. South Midlands Centre as long ago as 1914 and in 1928 he was elected a vice-president of the Institution. After further periods of service on various committees and councils of the Institution, he was elected president in 1944. In 1953 the Institution elected him an honorary member "for his services to the electrical engineering profession and to the science; and for his service to the Institution."

Sir Harry has been both chairman of the Council and President of B.E.A.M.A. and he serves on advisory committees of many Government Departments. For his many services to the industry and the nation he received a Knighthood in the New Year's Honour List of 1944.

Presidential Address

Sir Harry devoted his address to an assessment of the likely demand for electrical energy, and to the fuel supplies and technological developments that this will necessitate. The rate of increase of a country's demand for energy he suggested, is generally determined by the rate of growth of population, the continuing demand for a higher stan-

At the top of the page is seen the platform at the C.E.A. private meeting at Brighton on Monday

dard of living, the development of new industrial processes and appliances, and finally, the need to support human energy with the maximum of mechanical energy so that man is freed to make use of his higher skills.

In his opinion, the increase in demand for electricity in the United Kingdom is likely to be greater than 7% in the near future. Important among the reasons for this are the likelihood of relatively greater increase in production of heavy goods and materials compared with light industries, and in the increased use of electricity for transport and materials handling. With this background, and bearing in mind the Chancellor of the Exchequer's theme of doubling the standard of living of the country within the next 25 years, something around 400 million tons of coal per year are likely to be required at the end of the next quarter-century. Electricity consumption within the next 20 years will be more than trebled, and Sir Harry considers that existing estimates are conservative.

Technical developments which the electrical industry expects to contribute to this advance are treated at length in Mr Eccles' paper, but the President had three comments to make. First, there will be a move to higher pressures and temperatures, with consequent reduction in physical sizes of machines for given output, and the attainment of thermal efficiencies up to 37%. Secondly, units of 200 MW will come into use, and already 300 MW and 500 MW generating sets are possible, if not yet economical in this country. The third point Sir Harry made, was that still further improvements in efficiency may be expected at a later date by using steam pressures well in advance of the critical pressure of 3,200 lb/sq in. Speed of advance will depend largely on metallurgical and heat exchange research, and on improved methods of cooling in generators. The future of gas turbines will largely depend on practicability of using solid fuels in pulverised or gasified state, apart from the possibility of increasing temperature beyond 1,500° F.

Fuel Supplies

Even if the entire foreseeable increase in British coal production could be allocated to electricity generation, the nation would still be short, annually, of at least some 70 million tons of coal by 1979. Oil must be applied to fill the gap, and it seems possible to double the present consumption for each of the next two decades, so in 25 years of time, oil may be replacing 54 million tons of coal. The actual rate of replacement will depend on relative fuel costs. Nuclear fuel is of course the great hope for the future. However, by 1965 under present programmes, the saving in coal due to nuclear generation will be only about 6 million tons per year. After 1965 a further 1½ million tons a year saving may be expected annually, and from 1970 onwards it may be that the total programme of new generating plant will be installed in nuclear power stations. However, at this stage, coal will still be relied on to the extent of 60—75% of the nation's energy consumption, unless further advances can be made in the substitution of oil. Sir Harry emphasised that as far as nuclear generation is concerned, it is important that full inducement and encouragement should be given to companies prepared to work for its development. Such work demands that they divert much of their human and material resources into channels which will be unremunerative for a considerable time. Further, in this country manufacturers will have to rely largely on a single authority for orders.

1. Messrs C. Binns (E.M.E.B.), W. C. Lee (Eastern C.C.) and F. H. Holder (E.M.E.B.). 2. Mr and Mrs A. Ferguson, Mr E. A. Mills (L.E.B.), Ald. J. Bardsley (M.N.W.C.C.) and Miss D. Ferguson. 3. Messrs R. A. Finn (C.E.A.), E. G. Rawkins and Ald. W. A. V. Bryan (London C.C.) and Mr W. S. Lewis (M.E.B.). 4. Messrs D. W. Coates (N.W. and Mersey Div.), E. R. Wilkinson (C.E.A.) and C. T. Melling (E.E.B.). 5. Mr T. E. Daniel and Sir Joseph Hallsworth (N.W.E.B.), Mr and Mrs W. A. Gallon (S. Wales E.B.) and Mr A. O. Johnson (N.W.E.B.). 6. Messrs L. Howles (S. Wales E.B.), C. R. King (E.M.E.B.) and D. Bellamy (Y.E.B.). 7. Messrs H. R. Hornby, W. Wilde and W. B. Shannon (London Div.). 8. Lt.-Col. E. L. Luce and Mr R. R. B. Brown (S.E.B.). 9. Lord Citrine arrives. 10. Coun. G. T. Baldwin and Ald. E. Bond (Midlands C.C.) and Mr D. H. Kendon (M.N.W.E.B.)

Development of nuclear energy, in Sir Harry's opinion, gives a new opportunity in the British Commonwealth. If a Commonwealth pool of energy were established, the British nations would be in an unassailable position for overall progress, and could consolidate their economic position. Since some form of central co-ordination would be necessary to conserve both capital resources and scientific and technical manpower, an agreed Commonwealth power policy should be developed.

Finally in this section of his address, Sir Harry underlined the magnitude of the task involved in developing nuclear energy to the stage of optimum results.

Forecasting for 20 years inevitably brings into question the possibility of developments which at present seem remote. To take one factor determining this, the food and agricultural organisation of the United Nations estimated in 1953 that world population is increasing at a rate of eleven persons per thousand a year. At the maximum level, this would mean that the population of $2{\cdot}33 \times 10^{12}$ in 1950 would have increased to $2{\cdot}9 \times 10^{12}$ in 1975. This is obviously a challenge to find further energy sources.

Direct conversion of solar radiation into electrical energy and the storage of this electrical energy are the two major problems which challenge electrical engineers in the future. Sir Harry considers that a solution must ultimately be found to them if this increasing world population is to be supported at a higher standard of living. The sun's energy is derived from nuclear fusion processes, by which at a temperature of 100,000° C a gram of material will deliver a few MW for an hour or so. At present, the total power consumed throughout the world is less than one-ten-thousandth of the total solar energy arriving at the earth's surface. This shows the vast possibilities open to the future electrical engineer if he tackles ways of harnessing the sun's energy. Intensive work in the field of semi-conductors has given new hope to such developments. An array of barrier-layer-cells exposed to the sun's radiation has an overall efficiency of 6%, the theoretical upper limit being perhaps 20%.

In conclusion, Sir Harry emphasised again that electric power provides the foundation of economic progress, and that it penetrates every human activity. Only a full appreciation of this fact by the community will place at the electrical industry's disposal both money and manpower to enable it to exploit discoveries, spread the use of electricity and improve living conditions.

The Next Ten Years of Generation Development

By Mr J. ECCLES, C.B.E., B.SC., M.INST.C.E., M.I.E.E., M.I.Mech.E.

FORECASTING is an essential part of the business of operating an electricity supply organisation. Present practice in the Central Electricity Authority is to make a firm estimate of load growth and required plant capacity for five years ahead, and provisional and tentative estimates for the sixth and seventh years. In the paper which he presented on Wednesday morning, Mr J. Eccles, C.B.E., B.SC., M.INST.C.E., M.I.E.E., M.I.MECH.E., (deputy chairman, Operations C.E.A.), offers a 10 years forecast which extends into many details of plant construction and operation.

On the subject of load forecasting, Mr Eccles points out that three estimates are made each year. Area boards estimate their probable requirements at each point of supply, and cross check by aggregated estimates of the board's total requirements; independent estimates for each area are made by staff of the Central Authority on market research lines; and final estimates are based on the day to day experience of the Central Authority's system operation engineers. The common basis for all estimates is that the weather conditions all over the country are those of a comparatively short spell of moderately severe weather such as often occurs in mid-winter. Adoption of an estimate of load which is used as a basis of the plant programme in the year under review is a management decision based on this information. (Readers of the ELECTRICAL TIMES will recall a more complete description of the estimating technique in our issue of the 6th January, 1955).

Even if complete accuracy in the forecast could be achieved, there would still be other contingencies to be provided against. These include plant breakdown, late delivery of programmed plant and late recommissioning of overhauled plant. With regard to system load, the major uncertainty is of course the weather. The second main risk is some social catastrophe such as a trade slump. Finally, to provide for variations in what Mr Eccles calls the pattern of human behaviour a "spinning spare" must be provided at all times.

Fig. 1 shows the degree of accuracy achieved by recent estimates, and for comparison gives as well the U.S.A. Federal Power Commissions estimates. It should be noted that because of the shorter constructional periods in America, the Federal Power Commission is only now beginning to look at the position for 1959, whereas this year the C.E.A. will have to make a final forecast of the amount and location of the plant needed for the winter of 1960/61.

Plant Design

Having decided the generating capacity required, its type has to be set. British plans are based on the knowledge that the coal mined in this country will be insufficient to meet the nation's fuel requirements. This has conditioned the plant programme by putting an emphasis on nuclear power production. Mr Eccles comments that where native coal is abundant and cheap, there is probably less need to embark upon a nuclear power programme, at any rate until the necessary processes have been more firmly established, and the cost of power production determined.

The prospect of a large block of nuclear power being available raises questions as to the most economical size and type of conventional turbo-alternators and stations for the remainder of the load. Presumably the nuclear power station will work as far as possible on base load, and this means that future conventional stations must be capable of single- and two-shift working. This may place an upper limit on size of set and on steam temperature

and pressure. Manufacturers will be required to make all sets suitable for frequent stopping and starting.

Before describing the leading features of future plant, Mr Eccles traces the development of the 60 MW 900 lb/sq in., 900° F standard unit. He comments that this was the first true post-war development, and that 118 of these units have now been installed or ordered. Post-war developments in boiler design have enabled availability to be improved to the point where the unit system, in which interconnection with other boilers and turbines is omitted, becomes preferable. Although there is some reduction in availability because any boiler cannot be used with any set, the simplification of pipework, elimination of heaters and reduction in number of valves offsets this by reducing risk of breakdown. Boilers themselves have become altogether simpler, and the widespread use of welding has increased mechanical reliability. Steam driven auxiliaries have been increasingly eliminated.

On the turbine side an important development was the decision to break away from designing machines for most efficient performance at 80% of maximum continuous rating. This made possible the elimination of overload belts and simplified the design of cylinder castings without reducing machine efficiency.

Advanced Steam Conditions

With 60 MW units established, the next move was to higher steam conditions, 1,500 lb/sq in., 1050° F. Eight 60 MW units and ten of 100 MW have been ordered as a first instalment of this new development. Another obvious step towards higher thermal efficiencies is the use of re-heating, which is much simpler once the unit principle has been adopted. The first re-heating unit plant is to be 100 MW, 1,500 lb/sq in., 975° F t.s.v., with a re-heat temperature of 950° F. Four such units are on order.

This use of re-heating has permitted an advance in set size with less design work than is sometimes necessary. The last few blades on the low pressure rotor have to meet many onerous requirements, and their design is a major undertaking. Further, in developing a range of turbine sizes it is desirable to reduce to a minimum the number of

THERMAL EFFICIENCIES FOR C.E.A. TURBO-ALTERNATORS.

Turbo-generator C.M.R. MW	Pressure at t.s.v. lb/sq in.	Temperature at t.s.v. °F.	Reheat temperature °F.	Expected test efficiency on basis of kWh generated. Vacuum 28·9 in. %
30	600	850	—	29·3
60	900	900	—	31·9
60	1,500	1,050	—	33·7
100	1,500	1,050	—	34·5
100	1,500	975	950	35·4
120	1,500	1,000	1,000	35·8
200	2,350	1,050	1,000	37·6

blade sizes and profiles required. Re-heating made it possible to use the blades developed for a 100 MW straight cycle in a 120 MW re-heat unit which has initial steam conditions of 1,500 lb/sq in., 1,000° F, with re-heating to 1,000° F. Associated boiler rating is 860 klb/hr and eight of these units have already been ordered. They are steadily replacing the standard 60 MW units in current programmes.

Although the design of the 120 MW units exhibits no fundamental change from that of the 60 MW boilers and sets, certain trends are becoming apparent. As size of units, increases the ratio between furnace volume and the surface area of the water walls becomes uneconomically large, and gas temperatures are higher than desirable near the centre of the furnace. Manufacturers are divided as to whether to meet this situation by introducing a division wall of water cooled tubes extending either partially or completely across the centre of the furnace. This step makes corner firing impracticable. Another effect of higher steam conditions with the use of re-heating is that the amount of heat absorbed in superheating increases relatively to that required for evaporating the feed water. Consequently there is a trend towards using some of the radiant surfaces of the boiler for superheaters and reheaters. This tends to flatten the boiler temperature characteristic and, so to reduce the rate at which steam temperature falls off with load. Within limitations, this may be an advantage,

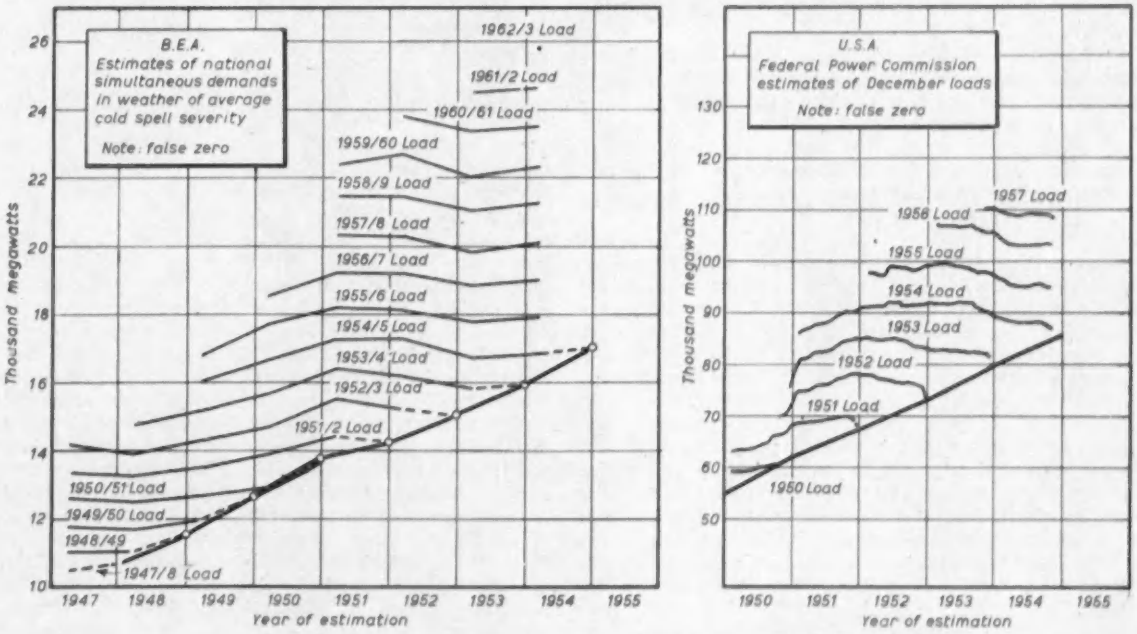


Fig. 1. Accuracy of load estimates for the former B.E.A. area and for United States

1. Messrs L. W. Welch (L.E.B.), H. J. Bennett (S. Wales Div.), W. Wilde (London Div.), W. J. Oswald (S.E.E.B.), and H. Lowe (S.E.E.B.). 2. Messrs P. Sydney and J. E. Blair (E.E.B.), Mrs G. A. Vowles, Messrs J. Anderson and G. A. Vowles (Yorks Div.). 3. Messrs O. S. Woods (E. Mid. Div.), R. P. Watson (E.U.N.I.), R. S. Gosling and H. G. Baigent (S.E.B.), W. W. Smith (E.M. Div.), C. A. Cameron Brown (C.E.A.), and H. R. Niven (E.M. Div.). 4. Messrs J. E. Blair, R. H. M. Barkham, G. N. Green, J. E. N. Davis and W. M. Maynard (all Eastern Board). 5. Mr S. E. Goodall (I.E.E.), Mrs H. W. Taylor, Mrs H. D. Watson, Mrs H. W. Grimmett, Mr H. W. Grimmett (M.F.P.), Mrs S. E. Goodall and Mr H. D. Watson (B.E.A.M.A.). 6. Messrs F. W. Skelcher, E. V. Hardaker, R. L. Batley, R. E. Cornish and H. S. Davidson (all Mid. Div.). 7. Col. T. F. Hood (S.W.E.B.), Messrs H. E. Midgley (B.E.A.M.A.), A. N. Irens (I.E.E.) and S. F. Steward (S.W.E.B.). 8. Messrs G. N. Green (E.E.B.), S. M. Rix (S.E.B.), J. E. Blair and H. Brierley (E.E.B.). 9. Messrs W. Gilchrist, R. M. Gravett (M.N.W.E.B.), H. Evans and Ald. J. Canon Bardsley (M.N.W.C.C.) and Mr J. Taylor (M.N.W.E.B.). 10. Sir Henry Self (C.E.A.), Messrs Parkinson (E.E.Co.), C. Anderson (Douglas, I.O.M.) and C. O. Coffee (E.E.Co.). 11. Councillor H. Lewis (S. Wales C.C.), Messrs W. N. C. Clinch (E. Div.), G. R. A. Carr (S.E.B.), Ald. E. H. Gibbon (S. Wales C.C.) and Mr H. E. Taunt (S.E.B.). 12. Mr C. Anderson and Ald. Teare (Douglas, I.O.M.)

for under two-shift conditions, the temperature of the steam delivered by the boiler after overnight shut down is usually rather low in relation to the temperature of the turbine.

With regard to efficiency under two shift conditions, expansion troubles with steam chests and steam piping are still a problem. Austenitic steels, which have greater creep strength at high temperature, enable metal thicknesses to be reduced, but because they have high co-efficients of expansion and lower thermal conductivities, they do not necessarily lead to lower thermal stresses.

Looking Ahead

In deciding the next step after the 120 MW re-heat programme, the Authority has had to keep in mind the value of standard components in minimising development costs, limitation of peripheral speed of the electrical rotor, and problems of evaporation as the 3,200 lb/sq in. critical pressure is approached. A unit size of 200 MW with steam conditions 2,350 lb/sq in. and 1,050° F at t.s.v. and re-heat to 1,000° F has been selected. Although opportunity was given to quote for either tandem or cross compound sets, the tandem design has been chosen for sets to be installed at the High Marnham stations. The 1,400 klb/hr boiler will be of twin furnace design with assisted circulation, but otherwise a normal development of a 120 MW re-heat unit.

To keep the alternator stator within road transport limitations, direct cooling of the stator conductor by circulating hydrogen actually through the winding has been necessary. The hydrogen pressure for these sets is to be 30 lb/sq in. Although with such direct cooling it is possible to obtain a much greater rating from a given alternator frame size, and consequently a lower cost per MW, against this capital saving must be placed the cost of additional losses due to much higher current density in the conductors.

Studies are at present proceeding on the possibility of steam conditions in the super critical range, perhaps in the region of 4,000-5,000 lb/sq in. In such studies it is necessary to pay careful attention to all relative factors and circumstances. For instance, increased rating normally produces reduction in cost per kW, but increased steam pressure and temperature tend to make the plant more expensive. Furthermore, higher steam conditions give higher thermal efficiency, but the value of this thermal gain depends upon the capital cost of achieving it, the price of fuel, and the load factor at which the plant is to run throughout its useful life. If nuclear power is readily available at a lower cost per kWh than that of coal, then clearly it will be in the interests of the supply industry to operate nuclear power stations at the highest practical load factor. Any improvement in design which reduces the capital cost of these stations without increasing the fuel cost will be pure gain. It is believed that the fuel cost per unit in nuclear power stations will be less than that of even the most advanced coal or oil burning station. Hence the problem resolves itself into how much nuclear fuel will be available, what will be the capital cost of the new stations and what is the right balance between capital cost and efficiency of the coal and oil-fired stations to produce the most economical result at their prevailing load factors.

The Electrical Industry as a Career

By SIR HENRY SELF, K.C.B., K.C.M.G., K.B.E., COMP.I.E.E., Mr S. E. GOODALL, M.Sc. (Eng.), M.I.E.E., and Mr R. A. MARRYAT, B.Sc., A.M.I.E.E.

WITH the general title "The Electrical Industry as a Career," Wednesday afternoon's session of the Convention was frankly directed to beyond present members of the industry. Three authors presented papers on this topic: Sir Henry Self, K.C.B., K.C.M.G., K.B.E., COMP.I.E.E. (the supply industry); Mr S. E. Goodall, M.SC.(ENG.), M.I.E.E. (manufacturing industry); and Mr R. A. Marryat, B.SC., A.M.I.E.E. (installation contracting industry).

Inevitably, much of these papers is concerned with reviewing the range of work that each of these sections of the electrical industry carries out, and with the general form of apprenticeship schemes. Such matters do not need extensive summary in these pages. The papers leave no doubt that formal apprenticeship schemes are available to fit all standards of ability.

Mr Goodall, commenting on the I.E.E.-sponsored report on "The Practical Training of Electrical Engineers" recalls that it recommends that each scheme of training should be divided into three parts: (*a*) basic mechanical training, (*b*) basic electrical training, (*c*) office training. He goes on to state their purpose in the case of the manufacturing industry.

The first period of basic mechanical training is designed to give the apprentice an acquaintance with workshop methods and processes, and with factory organisation. The second period is intended to give him opportunities for widening his knowledge of the properties of the materials used in electrical engineering and of the various methods employed in assembling and testing electrical equipment. Purpose of the final office period is to give the apprentice an introduction to the planning of production, and to design work, and also to provide as varied opportunities as possible to enable his supervisors (as well as himself) best to determine his functional ability.

A development in apprentice training remarked on by Sir Henry Self is the increasing amount of student exchange between supply and manufacturing industry. It is normal for student apprentices in the supply industry to spend about six months with engineering manufacturers on the erection and test of equipment. Now, to an increasing extent, apprentices from manufacturing concerns are coming to serve a few months with the supply industry on an exchange basis.

Education

All three papers give close attention to the educational aspects of an engineering training. Mr Goodall is particularly interesting here with a discussion of the past difficulties of the National Certificate scheme, and its future prospects. He points out that a basic problem in using National Certificate courses for the education of professional engineers has been that many of the entrants to the courses have lacked a sufficient knowledge of general science and mathematics. Some improvement is now apparent, however, with more and more of the entrants having achieved some success in the General Certificate of Education.

Another severe difficulty facing those who have designed National Certificate courses has been the need to provide a satisfactory course for the man who will proceed to professional status, and at the same time serve the technician who will go no further than O.N.C. The situation may be helped in future by the efforts of the City and Guilds of the London Institute to provide for technicians an alternative to O.N.C.

The alternative to the National Certificate course which Mr Goodall advances for professional engineers not receiving a full-time education is the sandwich scheme, such as the I.E.E. is sponsoring, and he receives support from Sir Henry Self. General basis of such a course is the spending of six-month periods alternately at a technical college and in the works, spread over four years. It is fundamentally necessary to keep up the standard of entry to such courses, and General Certificate of Education with five passes (including mathematics and a science) at ordinary level is suggested. The first full-time technical college period would be preceded by a year of part-time attendance at a second year O.N.C. course. An advantage suggested for this scheme is that it will give a reasonable margin of extra hours over and above those required for purely technical or scientific studies.

Mr Marryat, dealing with apprentice electricians, suggests that there is difficulty in deciding whether a lad of 16 years will or will not profit by taking a National Certificate course rather than one of the City and Guild

ROUTES TO PROFESSIONAL ELECTRICAL ENGINEERING

Age	Part-time Evening	Part-time Day and Evening	Sandwich	University
	Entry at G.C.E. (O) Level	Entry at G.C.E. (O) Level	Entry at G.C.E. (O) Level	Entry at G.C.E. (A) Level
16+	S. 2+ Eng. Drawing	S. 2+ Eng. Drawing	Pre-entry part-time (or S.2)	—
17+	S.3	S. 3+ (OE)	S.D.I.	—
18+	A.1	A.1+ (OE)	S.D.II	I
19+	A.2	A.2+ (OE)	S.D. III	II
20+	Endorsements	Part III, *Elec. Eng.+ (E)	S.D. IV	III
21+	Eng. Physics. + Part III Elec. Eng.	(National Service)	(National Service)	Practical Training I
22+	(National Service)	(National Service)	(National Service)	Practical Training II
23+	(National Service)	Part III 2 Special Subjects (Evening)	—	(National Service)
24+	Part III 2 Special Subjects	—	—	(National Service)

(OE) Subjects which may be optional or offered as endorsements to O.N.C. or H.N.C. (E) Endorsement Subjects.

Left to right Sir Henry Self, Mr S. E. Goodall and Mr R. A. Marryat

courses. He suggests that in such cases there is much to be said for entering the apprentice for the first year of both courses, and relying on the results of the first year examinations to decide which should be followed.

Opportunities

Naturally, all the papers contain some evaluation of prospects in their various sections of the industry, and in view of the eminence of the authors, these are no doubt of interest to those already working in the industry. Mr Goodall states bluntly that once a young man has been accepted as, say, a student or graduate apprentice, his future is from that moment assured, provided, of course, that he has some measure of personal aptitude, tenacity and integrity. This is one result of the care taken to offer well-balanced and carefully designed education and training facilities, much developed from the "rough and ready" methods that used to apply.

Training systems start on a wide basis, so that specialisation and choice of function can be determined when the young man concerned is sufficiently mature and knowledgeable to effect the choice that is wisest in his own interests. Most engineers, Mr Goodall considers, find that as they progress in life, a proportionately greater amount of their time has to be spent on administration matters. In this respect, there is an increase in the number of companies who have boards of directors containing many engineers and scientists.

Sir Henry Self presents the supply industry as offering a triple attraction: close inter-relationship with other skills, the satisfaction that comes from being part of a primary service that touches the life of the community, and finally the thrill of being involved in an industry in the van of technical advance.

As a personal viewpoint, which he emphasises is not widely shared in the industry, Sir Henry advocates the formulation of specific professional career schemes. These would give individuals specific standards of achievement to which they would rise if they were able to do so. The present method of the industry is to rely on the classification of appointments on a common ladder, without any indication of the specific careers to which individuals may aspire. It is argued by Sir Henry that this means in the long run an undue emphasis on the possibility of rising from the bottom upwards, and increasing difficulties in the form of side entries from outside at points up the common ladder. This may result in difficulties in ensuring an adequate influx of experienced professional people at a maturer age, though they might be more willing to come in if they had a more considered career in prospect than the common list. However, Sir Henry agrees that the industry is meeting a fundamental need successfully, in ensuring that everyone, however humble their point of entry, may aspire to climb right up the ladder if they have the necessary ability.

1. Messrs J. Ingleton (Carron Co.), R. G. Dick (C.E.A.), R. Benzie (N. of S.) and J. I. Paton (Carron Co.). 2. Mr A. C. Farquhar, Rt Hon Tom and Mrs Johnston (N. of S.). 3. Messrs R. L. Higgin, C. A. Turner and P. D. Trickett (Diamond H). 4. Ald. and Mrs F. Manton (N.E.C.C.) and Mr C. C. Cockbain. 5. Messrs J. Davidson, C. B. Cleland, R. D. W. Bowle and L. H. Saunders. 6. Mr G. H. Bayliss, Mrs Bayliss, Mrs Looker, Messrs. J. J. Looker and A. Montgomery. 7. Mrs I. F. Young, Messrs A. V. Burnett, G. Hodgkin, I. F. Young and A. S. Brewer

At the Convention Exhibition. 1. A group of delegates gather at the Falk Stadelmann Stand. 2. Messrs R. Birt, W. E. Brandeth, Mrs Smellie, Mrs Looker, Messrs J. J. Looker, J. Smellie, H. G. Smith and A. Montgomery. 3. A cable-making group—Messrs J. H. Sutcliffe Ross, R. E. Prickett, W. Sim and H. C. C. Budd. 4. Messrs H. P. Martin, G. T. S. Dickson, W. D. Watts, L. Abrahams, Mrs Dickson and Mr M. Higham. 5. Attention for the S.T.C. exhibits. 6. Sir Harry Railing opens the Exhibition. 7. Mr S. F. Steward makes the presentation to Lady Railing. 8. Messrs R. W. Langley, R. Cox, G. Caton, A. W. Garrott and M. H. Holland. 9. On the English Electric Stand—Sir Edward Crowe, Mrs J. D. Daniel, Mrs L. A. Muirhead and Mr J. R. Green. 11. Prestcold products attract Messrs F. R. Best, J. D. Andrews, Mrs H. Key and Mrs B. Rutter

Sir Henry states that the general view is that the situation can be held better with fairness to all and without detriment to the future by the present method.

For the contracting industry Mr Marryat places emphasis on the wide variety of callings to which apprenticeship as an electrician may lead. Consulting electrical engineers, for example, have no means of giving basic practical training to their future personnel, and work with a contractor is obviously a desirable basis for those who will have to plan and specify such work.

Personal Views

Besides surveying the work, educational methods and prospects of the various sections of their branches of industry, the three authors all advance personal views on likely or desirable developments. Mr Goodall, for instance, sketches the scene of technical education for industry as it may be after a few years.

Craftsmen, he suggests, will continue much as at present, with City and Guilds courses being followed where appropriate. Technicians will be recruited from every type of school and at 16 will start on the first year of the new basic course being developed for technicians. It may be that this first year course will be common to both the technician's qualification and National Certificate. After the first two years a first certificate may be awarded, and another two years of study will lead to a Main Certificate. Possibly another year would lead to a final certificate which, if approved practical work has been undertaken, can be sponsored by some technician's association.

Higher National Certificate courses in conjunction with part-time day release are likely to continue on present lines to meet the needs of would-be professional engineers, but two years of further study will normally be required to satisfy the new Part III of the I.E.E. examination. The table shows how this and other routes to a professional qualification will fit in with military service.

Some predictions on the future of the contracting industry were ventured by Mr Marryat. In his opinion the redrafting of the I.E.E. Wiring Regulations in a form that will be to all intents and purposes, enforceable under the Electricity Supply Regulations, together with the setting up of a National Inspection Council, should help to accelerate improvements in design and workmanship. Further increasing attention will undoubtedly be paid to matters affecting safety. The existing system of competitive tender controlled by financial consideration only is subject to abuse, and in the course of time it is likely that the emphasis in competition will rest more and more on availability of staff, organisation and equipment to do the required work quickly and effectively.

For various economic and practical reasons, the number of small contracting firms is likely to diminish rather than increase, but most of the existing units of the industry must inevitably expand in order to deal with the increasing volume of work that will be demanded.

Some of Sir Henry Self's views have already been noted. He further places emphasis on the importance of management obtaining its training in a range of industries. For this purpose, he recommends that the bars which at present exist to people moving around between industries should be removed, particularly that of superannuation.

notes on wiring

by Megohm

IN most industrial plants to-day sequence and repetitive processes are controlled by electrical equipment. In days gone by, this method of controlling such operations was looked upon in wonder by many people, but to-day we are quite used to having our most complicating timing requirements dealt with expeditiously by experts. Oil-fired boiler houses are a common example of the need for timing devices. Here, many operations must take place before ignition occurs and, of course, in factories the need for these devices is far spread.

Timing Contactor

I recently saw a timing contactor which was doing a good job of work in a small factory, and the neatness and possibilities of this appealed to me. Manufactured to line up with other control gear made by the firm, the contactor is very neat and compact and can be obtained for either surface or flush mounting. For general purpose use the case consists of two mild steel pressings with knockouts on top, back and in the back of the base portion. Also provided in the back are holes for fixing. The industrial pattern case is made of cast iron with gasketed cover and the flush pattern has a cast aluminium box with sheet steel cover plate. The actual interior is suitable for mounting in machine tool casings.

The contactor incorporates, in one standard unit, a 25 amp t.p. contactor integrated with a pneumatically operated timing device, designed for automatic and instantaneous re-setting, with a range of from zero to two minutes. It is set in motion after the main contacts, which are rated at 25 amps, have closed. At the completion of the time cycle, a plunger acts upon the 10 amp auxiliary switch, which then closes and/or opens a separate circuit. I did mention earlier that this contactor was in keeping with other control gear made by this firm and, in fact, the base, fixed, moving and auxiliary contacts, magnet and magnet coil are all identical with one of the ranges. This makes for speedy and economical maintenance from a small number of spare parts. It is particularly interesting to note that the components cannot be incorrectly assembled. This is achieved by a unit method of construction and the use of locating devices. The main contacts and terminals are accessible from the front of the unit.

The timing device has an adjustable air valve for controlling the delay period and time setting is adjusted from the front of the unit by means of a knurled knob.

The applications to which one or more of these contactors could be applied are numerous. They could be used for periodically reversing a machine, control of lighting and they are especially adaptable for oil-fired boiler plant where control of forced draught fans, etc., is required. A very useful piece of equipment indeed.

Convention Features

There is much to interest visitors to the B.E.P. Convention Exhibition. I was interested in a new range of 13 amp sockets, available for flush or surface mounting with an unusual feature. All three pins have to be fully inserted before the shuttering is moved. Personally, I think this is quite a sound practice in shuttered sockets for these are often subjected to investigation by those who are ignorant of the dangers involved in pushing something other than the plugtop into the sockets. It is surprising just how many ordinary people, especially children, know how to move the shutter of a socket. The fact that all three pins must be inserted before the shutter moves should puzzle the inquisitive person. The sockets are made with both bakelite and porcelain interiors. The main feature about the plugtops for these sockets is that the fuse is clearly visible and the amperage of the fuse can be seen at a glance. This manufacturer also introduces a new range in weatherproof plugs and sockets which are manufactured in brass with a steel bronze finish, the interior being of an approved plastic material. Weatherproof sockets are coming into more demand these days when the keen gardener can mow his lawn and trim his hedge by electricity and a robust type of socket is essential for such situations.

The recent trend for coloured household equipment has been carried a step further by the introduction of pastel colouring for water heaters. Quite a new line of these attracted the attention of the ladies. With invisible fixings and flush fitting backs these water heaters should, in my opinion, get a ready sale.

It pleases me to see so many manufacturers giving emphasis to the need for good lighting and power installations in the home. The matter of an adequate number of sockets in the home has become an advertising feature of most socket manufacturers and now the lighting in homes is being tackled in the same manner. We are generally inclined to treat house lighting very casually, more attention being paid to appearance than efficiency. But thoughts, like fashions, are changing and the need for good lighting is recognised and being furthered by the lamp manufacturers.

A prototype of a new cradle to assist maintenance of mercury and tungsten lighting aroused much interest. Although developed for a particular industrial plant it could, no doubt, be adapted for other situations. The cradle consists of a frame of two-inch tee section carrying a floor of rigid wire mesh, divided into two parts to support the lamp housings. The fittings rest on the wire guards which also serve to prevent broken glass from falling in case of accidents to the glass. The fittings are connected to the control gear by means of flexible cables and can be picked up and serviced on the walkways, control gear being housed in containers and hung from a handrail or other convenient point.

Another interesting new product on view is a time-controlled unit for immersion heaters which can be set at any time factor up to 120 minutes. The user selects 30 minutes or 45 minutes, according to experience, and the unit switches off the heater at the selected time. I have made up my mind to purchase one of these units and really get down to a study of the economics of water heating by immersion heater methods. It should prove extremely interesting.

Electricity serves the Ridings

COMMERCIAL ACTIVITIES AND DEVELOPMENT WORK IN THE YORKSHIRE ELECTRICITY BOARD

A TURNOVER during the financial year 1954-55 almost double the previous year's total for sales and contracting work is an achievement of which the commercial organisation of the Yorkshire Electricity Board can be justifiably proud. The native of these parts is traditionally thrifty and rarely parts with his hard-earned "brass" unless convinced that he's on to something worthwhile! This striking increase has been largely the result of the extended long term hire purchase facilities which the Board has until recently been able to offer, but even so such a turnover reflects the hard work of the service centre and sales staffs in its achievement.

Some 4,000 sq miles of territory are served by the Y.E.B. with a population of over 4,000,000. This area embraces the industrial West Riding, the predominately agricultural lands of the East Riding and the Lindsey division of Lincolnshire, along with border areas of Nottingham and Derbyshire. A certain diversity of industry is introduced in the eastern section by the existence of the Humber ports and the iron and smelting centre of Scunthorpe, this being balanced in the west by the rural beauty spots and farming lands of Airedale and Wharfedale.

Commercial Organisation and Policy

Industrial demand for electricity in the area is steadily increasing, there being in March last year, 17,926 industrial consumers who used over 3½ million units in the year. In 1948 the Board made a survey of the area which showed that there were 392 villages and 20,000 potential agricultural consumers. Thereupon a five year plan was drawn up and put into operation aimed at providing a supply to every village in the area by March 1954. Subsequent restrictions in capital expenditure interfered with this plan but changes in Government Policy have now enabled the Board to catch up on their work to some extent with the result that they were only 64 villages short of the target at the end of the five year term. Unfortunately, there were at that time still some 16,000 agricultural consumers without supply but more recent plans for further accelerated development aim at the connection of all villages still without supplies and at ensuring that by the end of the 1961/62 fiscal year supplies will be available to 90% of the population living in rural areas. Isolated farms which cannot reasonably expect supply in the foreseeable future are being informed so that they can make their own arrangements for electricity supply from their own private plant. Latest figures available (as at February 1955) indicate that there are at present 13,054 agricultural consumers, as against 10,232 in the previous year whilst commercial consumers now number 129,000, an increase of 2,000 for the year. Domestic consumers total 1,204,000 a 3·6% increase on the previous number of 1,164,239 and they use an average of 1,100 units a year.

To cope with the problems of administration the Chief Commercial Officer has three Assistants who are responsible respectively for "Special Agreements," "Tariffs and Statistics" and "Development." These titles loosely define the activities of the officers. The "Special Agreements" Assistant is responsible for the co-ordination of affairs of large consumers affecting more than one sub-area but in addition he is concerned with street lighting and to a large extent rural development. Contracting, testing, approval and sales of appliances, hire and hire purchase and publicity are matters concentrated in the hands of the officer concerned with "Development" and consequently he maintains a close contact with the 75 service centres which are now operating in the area.

Consumer Service

The service centres have, in the main, been inherited from the former supply authorities. Some 48 former municipal and company undertakings showrooms were vested in the Board along with 13 showrooms owned by Electricity House Ltd., a company associated with the old Yorkshire Electric Power Co. Various centres have since been moved to new premises and fourteen completely new centres opened. These centres are naturally varied in design according to locality and are supplemented by four mobile units to provide immediate service centre facilities as required. One of the most impressive centres is at Hull, housed in a most commanding building. Good use of the first floor windows all round the building is evident in the showcard displays which are illuminated at night. The smallest centre in the area is at Pontefract, but the majority of the centres are housed in normal retail shops. The Headrow centre in the heart of Leeds is probably one of the busiest in the area and has a staff of 12 dealing with the flow of consumers numbering some 750 per day with 2,000 at peak periods, to pay energy accounts or make purchases. The street level section of

Publicity displays, illuminated at night, occupy the whole of the first floor windows of the Hull centre

this centre is divided into a reception enquiry area and general sales and an accounts bureau, whilst the basement floor has two large rooms for the display of appliances. Plenty of space for consumers to inspect appliances is available although the entrance to the stairway leading to the basement section is unfortunately not very prominent. One of these rooms affords excellent facility for the comparison of many different models of cookers, laundry equipment and refrigerators, whilst the other is devoted to lighting fittings and small electrical appliances. Demonstration of both electric cooking and home laundry work are held twice weekly in the sub-area radio and television demonstration centre in nearby Albion Street though various manufacturers have periodical demonstrations of their appliances in the Headrow centre.

Two of the five outside sales representatives working from the Headrow are women. Their principal occupation at the moment is the development of the domestic load on local authority housing estates. In following up sales enquiries they have obtained many valuable leads on neighbouring consumers as potential customers for appliances. The men representatives are concentrating on new building work, offering advice on the facilities which the Board affords and at the same time checking on the lists of new occupiers for follow up.

Window display is a subject of competition amongst Yorkshire service centres. Window display material is in some cases designed and made up locally for service centre staffs are encouraged to take an interest in their windows, but more costly display set pieces are made at the Board's Display Centre at Dewsbury. Mainly as a matter of policy, load building appliances are the subjects of current work but publicity varies with seasonal requirements and takes into account stock positions. Displays are changed at approximately fortnightly intervals to maintain interest. Service Centre and District staffs also undertake the arrangement of another facet of consumer service—film shows and lectures for youth and similar organisations.

Extended hire purchase schemes for Cookers, Immersion Heaters and Washboilers in force until early this year were very successful and the work associated with them so involved the sales staffs as to hold up any serious drive for commercial catering business but now that hire purchase restrictions have been re-imposed there may be time for development in this field. In the absence of special catering showrooms arrangements are made for potential customers to visit places with equipment installed and to go to manufacturers' works.

For the convenience of consumers in paying their accounts the Board maintains "cash collection" centres. These collection centres are church halls or other accommodation hired for short periods of peak account paying. When possible a small selection of cookers and other appliances is put on view at these centres and this is appreciated by the local consumers.

Mention was made earlier of the rural development plans to provide electricity supply to 90% of the villages and communities in the area within the next ten years, and it is appropriate to note here that the Y.E.B. sub-areas have on their staffs farming specialists to give expert advice to consumers.

Sales and Contracting

Figures given to the end of February this year indicate a large increase in turnover of sales and contracting. Returns show that sales of vital load building equipment in the form of immersion heaters have increased by some four times on last year. Cooker sales are nearly doubled and sales of washboilers, washing machines and refrigerators are up about 3 times, whilst those of suction cleaning and polishing appliances show a 50% increase and there has been twice the business done in radio. Television sales, however, seem to have remained at the same level. These increases in cooker, immersion heater and washboiler turnover are mainly attributable to the extended hire purchase facilities which were in force from December 1953 to February 1955. Briefly these schemes included several models of cookers on terms of 48 quarterly payments, and water heaters and washboilers on repayment by 40 quarterly payments. These terms included installation and wiring costs and this created a great demand on installation work. The Board entered into an agreement with the local private contractors to share this work and about 50% of it is done by them. This is but one example of the good relationship maintained with the contracting industry by means of the standing Area Contractors Advisory Committee instituted in 1949.

An enterprising tie up with electric cooking and a local Royal Air Force recruiting campaign was achieved by the Leeds centre display staff, in their Albion St side window

Although the Board do not normally offer appliances on simple hire there are still some old simple hire agreements in force. A few of these agreements are at pre-war rates for pre-war apparatus.

Purchasing of equipment and appliances is in the hands of sub-area managers although in some cases smaller appliances are bought at district level. Very little bulk purchasing occurs these days as in most lines which now have list prices and fixed discounts little advantage would accrue. Before appliances are purchased for resale to consumers they have to be tested and approved. The procedure is that when a trader wishes to sell his products to the Board he approaches a sub-area. If they are interested they will request Head Office to have the appliance tested. If it is approved the trader or manufacturer and the sub-area are notified. Appliances are graded into three classes. It is either (*a*) approved for general stocking, or (*b*) for individual purchase at the request of a consumer, or (*c*) rejected and referred back to the manufacturer with the comments of the Approvals Sub-Committee. About one hundred appliances are tested annually.

Unfortunately, the Chancellor's recent pronouncement restricting terms of hire purchase to 2 and 4 years has had considerable "braking" effect on turnover. Public reaction has been varied, in some places there has been a tendency

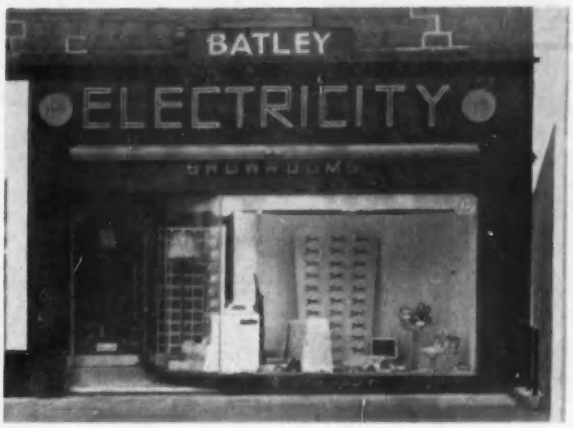
This mobile showroom invites entry and affords a good stage for demonstrations

to hold back especially on the larger more expensive items but the Board feel that they still have many strong points on which to sell cookers and water heaters, particularly in the matter of cleanliness, simplicity and economy of operation. On the vital question of economy of operation the Board's sales staffs are able to point out that the domestic tariff gives consumers in this area the lowest price in the whole country for energy supplies for domestic purposes.

Training and Encouragement of Sales Staff

A "Commercial Circular" which is distributed throughout the whole selling organisation of the Board is a monthly newsheet on the lines of that issued by the South Eastern Board and has a similar function. It is designed to keep commercial staff informed on Y.E.B. affairs and policy and circulates down to the more junior employees. It does not give competitive results of the various service centres and sub-area organisations but this particular information is available to Sub-Area Managers and District Commercial Officers.

Up to now the training of service centre and sales staffs has mostly been done "on the job" but the E.D.A. Salesmanship Course has been taken by a large number of the sales and service centre personnel. Plans are under consideration for residential courses. As an interim measure Grimsby and Wakefield sub-areas have had training courses run by an outside sales consultant. Under this arrangement there have been at each course some twenty service centre staff and representatives and they were given a week's course on sales technique, appliances knowledge and "looking after the customer." Two one-day conferences were held last September and October for sales staffs from all parts of the area at Ilkley and Hull. Some 100 delegates attended each conference which took the form of an evening reception meeting followed next day by morning and afternoon sessions. In the morning the delegates were grouped in syndicates of about twenty under an elected chairman and were free to discuss any aspects of the 1954 B.E.P.C. paper on "Development of the Domestic Load at



Batley centre, a former Electricity House shop, is typical of the majority of Y.E.B. centres

Home and Overseas" presented by the Board's Chairman, Mr Bellamy. After a conference luncheon the syndicate then joined in general discussion and each presented via its chairman its findings to the conference. This afforded a valuable interchange of ideas and viewpoints.

Display and Publicity

The Board has a Display Centre at Dewsbury which produces a large part of the window display material for service centre windows and exhibitions. In addition, printing work is done there amounting to some 500,000 forms monthly. Silk screen printing for displays and posters, Masseeley printing of showcards and tickets and the construction of displays and exhibition stands are functions of the centre. Evidence of output and success are to be found in the creditable figure of 842 display pieces made, supplied and used in all Yorkshire Service Centres last Christmas and in the success of the decorated vehicles, designed by the Central Display Department, in the competitive events of local carnivals. Out of the ten carnivals entered last year the Y.E.B. gained eight first places and one second. In the Grimsby Hospital Gala the Yorkshire Board vehicle took first place amongst fifty trade vehicle entries.

Stands are taken at some twenty-five principal agricultural shows in the shire and more or less the same number of stands are taken in local exhibitions but the number of the latter is being stepped up this year to around the seventy mark. The local exhibitions staged by the Board are usually of two or three days in duration and are designed to encourage increased installation of load building equipment. Most recently the Town Hall, Grimsby, was the scene of an exhibition on "Electricity in the Home" with daily cooking demonstrations.

This Y.E.B. vehicle won 2nd prize in Ripponden carnival

Experimental and Development Work

An important but indirect consumer service is at present being undertaken by the Board in the form of co-operation with the C.E.A. Utilisation Research Committee. At Keadby the Central Authority have built some 180 houses for the new power station staff some of whom will act in the way of "guinea pigs." Six of these houses incorporate floor warming for research into its effectiveness in heat-insulated but otherwise ordinary houses. These six houses have specially built experimental "fridge-heater" heat pump installations and in 80 of the other houses electrical appliances are grouped on to specially metered mains circuits so that valuable information on diversity, loading and similar factors in different sized housing units can be gained. The cookers installed have specially metered local circuits to obtain knowledge of the relative usage of hobs and ovens. Half the cookers have solid and half have radiant plates and after trial periods these will be changed over to get the relative efficiencies under similar conditions and consumer preferences will also be learned.

The Yorkshire Board has conducted a number of experiments on other housing estates to discover the economics of supply and load characteristics again by special metering arrangements but the Keadby experiments are the most thorough in the matter of special mains and wiring installation arrangements and for the determination of the incidence of the water and space heating loads as against the cooking load and the usage of other appliances.

Statistical research into load curves and domestic usage has been supervised by the Assistant Chief Commercial Officer concerned with tariffs and statistics. A sample survey has been undertaken mainly for the overall national survey just concluded but it has been adapted to help the Area Board.

We are indebted to the Chairman and Officers of the Yorkshire Electricity Board for the facilities afforded us in our investigations.

Germanium from Flue Dusts

FLUE deposits have from the beginning been one of the many sources of germanium, the element used in the construction of transistors. Power station flue gases at first sight seem a promising source of this element, but early work (as reported earlier in the ELECTRICAL TIMES) showed that worth-while amounts of the element were not available in deposits. Now it seems that boilers with chain-grate firing may give concentrations of germanium sufficiently high for extraction to be commercially practicable. This is stated in a recent paper prepared by Messrs E. A. Howes and B. Lees of the Central Electricity Authority for the Institute of Fuel.

Experimental Work

In the work reported, Northumberland soft coal was burnt in retort-stoker-fired boilers fitted with Centicell grit arresters. Samples of fine dust (of the order of one micron particle size) from the flue gases had germanium concentration of 0·1 to 0·2%, and when samples were drawn from the flue gas stream before the Centicell, concentration was as high as 0·3% of the total fine dust. With a chain-grate boiler firing Hartley Main washed smalls (known to be relatively rich in germanium) the germanium concentration in the flue gases assayed as high as 0·54–0·70%. Boilers using pulverised fuel firing gave only 0·006% germanium in the dust from Centicell and electrostatic precipitators. The table summarises available information on the distribution of germanium in boilers of different types.

It is concluded that some 30–40% of the germanium in the coal burnt is present in the fine dust from mechanical-stoker plant in concentrations suitable for commercial extraction, and these concentrations may perhaps be enhanced by ensuring that a station receives suitable fuel. The remaining 60–70% of the germanium is present in the clinker and coarse dust in concentrations which are not commercially recoverable. Experiments suggest that over a range of fuel bed temperatures and boiler sizes the quantity of germanium in the fine dust is not appreciably affected.

GERMANIUM DISTRIBUTION IN VARIOUS TYPES OF BOILER

Type of Firing System	Ge in coal p.p.m. (actual)	Ge from coal, p.p.m. (calculated)				Percentage distributed		
		Clinker	Coarse dust	Fine dust	Total	Clinker	Coarse dust	Fine dust
Retort	10	4·3	1·45	4·8	10·5	41	14	45
	8	3·1	1·1	2·8	7·0	44	16	40
Travelling grate	13	3·9	1·0	3·3	8·2	48	12	40
	10	2·2	1·5	3·1	6·8	32	22	46
P.F.	13	6·0	7·0*	0·24	13·2	45	53*	2

* Dust from main electrostatic precipitator on boiler.

Unfortunately, in view of the trends in boiler design, there appears to be no method of extracting germanium from the dust from pulverised-fuel-fired boilers at a commercially practicable cost, owing to the dilution effect of the fine pulverised fuel ash.

A Large Thermal Storage System

HEATING SYSTEM FOR THE UNIVERSITY OF LONDON DEVELOPMENT IN BLOOMSBURY

THE University of London development in Bloomsbury, consists of a collection of buildings of which the most prominent feature is the Senate House and its tower, now a familiar London landmark. Building on this scheme has been proceeding for many years, the Senate House having been completed in 1936. This building was (and still is) heated by a "direct" electrical system—as compared with thermal storage—and a full description of the installation was given in our issue of 29th July, 1937, in an article written by J. Stinton Jones. Briefly it consists of a large number of thermostatically controlled wall panels, the heating elements being made of Nichrome wire spirals embedded in a refractory material and encased in metal tubes. These units are designed to give an even surface temperature of 165° F, and as the surface material can be made of high thermal storage capacity substance. (Travertine and marble being commonly used) the panels can be switched off for a considerable time without producing much difference in ambient temperature. This facility proved most useful, both for alleviating the peak load on the supply system, and for giving load shedding conveniently during the post-war period of power shortage.

The main supply for the system was taken from specially laid 11 kV mains belonging to the then County of London Electric Supply Co., and these mains also supplied all other electrical services. Two 4,000 kVA transformers, with a voltage ratio of 11 kV/400/230 volt provided low voltage current for the whole of this section.

Thermal Storage

By 1939, plans for the further development of the site had been completed, and although the original system had given every satisfaction, the decision was taken to change the heating method for the future buildings to thermal storage. Two main reasons were responsible for this, first, advantage could be taken of the off-peak preferential tariffs which were then available, and second, it was thought that a ceiling panel hot water system would give more latitude in architectural design. The alternative of a direct fired system using oil or solid fuel was also considered but was rejected because of the requirements for a chimney stack, and in addition it would be essential to provide storage space for fuel.

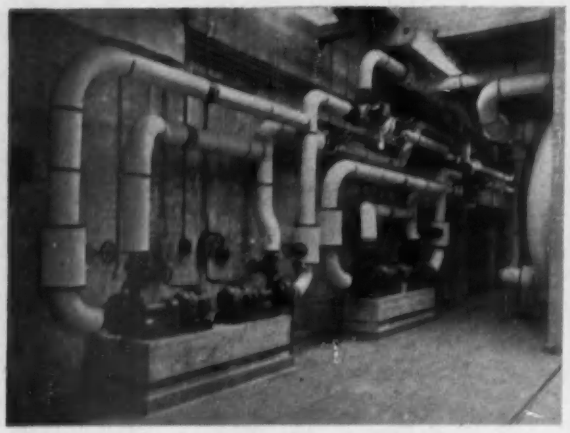
Fig. 1. The new Students' Union Building next to Birkbeck College on the Malet Place—Torrington Square site. Senate House tower, a London landmark, is seen in the background

The modified plans of the University envisaged the erection of a group of buildings surrounding one of the Bloomsbury Squares — Torrington Square — which lies centrally within the site, and it was consequently convenient to house the heating chambers underground at each end of the square.

By 1941, work on the buildings, which had been held up during the war, was sufficiently advanced for the installation of the first electrode boiler system. This consists of a Sulzer electrode boiler operating at 11 kV and rated at 2,500 kW, feeding two storage tanks each of 17,500 gallons capacity, and it supplies the School of Oriental and African Studies and Birkbeck College. The remainder of the site continued to develop, however, at a speed governed by the restrictions on capital expenditure, and this development involved at an early stage the establishment of a second and much larger heating system which should be capable of providing all requirements for the future of the complete building scheme. It is with this heating system that this article is principally concerned.

Requirements

The requirements of the new system are to provide both space and domestic water heating demands for the remainder of the site development, and it has to be integrated fully, both electrically and from the hot water aspect with the existing system. To preserve amenities, it has been located below ground in a similar manner to the first electrode boiler system, but as near as practicable to the centre of load which it will have to feed in the future. Control is to a large extent automatic, supervisory functions being exercised by the engineer in the centralised electrical control room in the main building. This room is located in the basement of the Senate House and is some 800 ft from the new heating chamber. The work on this system is to be carried out in two stages; Stage I, which is now complete, serves the Students' Union Building, and has one 3,500 kW electrode boiler together with its auxiliary plant including two 22,500 gallon storage cylinders, and Stage II, for future buildings on the Woburn Square front-



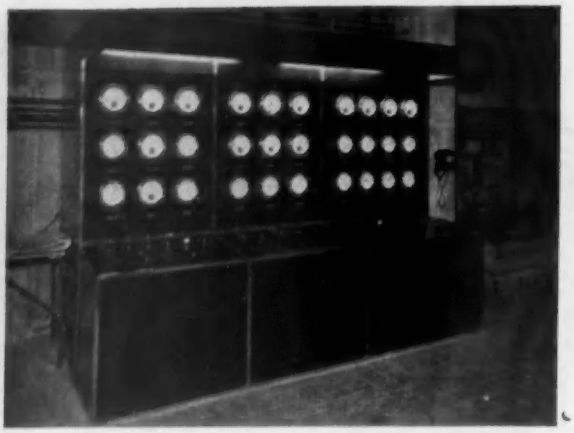


Fig. 2. Circulating pumps for high temperature and panel system water with (right), Fig. 3. Local control panel in the North heating chamber

age, will involve the installation of two further 3,500 kW boilers together with two further 22,500 gallon storage cylinders to give a total capacity of 10,500 kW.

Power Supply

To supply the power for this heating chamber, the London Electricity Board have provided an 11 kV feed which is controlled by B.T.H. switchgear belonging to the Board. Three switches will ultimately be installed for the feeders to the three boilers. In series with the Board's switchgear is (for the present installation) a Reyrolle 440 amp, 11 kV triple-pole metalclad oil-filled circuit-breaker with operating gear and isolation facilities. This belongs to the University and provides the main boiler switching. Protection is provided against earth-leakage, overload and out-of-balance. Current transformers in each phase feed three ammeters and the load control relay on the local control board as well as providing for protection. As the switch is essentially a control switch, the c.t.'s are in the live side of the circuit breaker. A potential transformer is also connected to two of the incoming phases to supply the voltmeter, and to energise the coil of an under-voltage relay, providing the coil of a no-voltage relay is also energised from the low voltage circuits feeding the pump motors, and other auxiliaries. The switch trips instantly on failure of the h.t. supply. From the switch, cleated cables carry the power to the electrode boiler.

Auxiliary equipment, including the boiler circulating pumps, storage pumps, panel system pumps and high temperature circulating pumps, take power from a 415 volt 3-phase supply. A single-phase supply is also available at 240 volts for the trickle charger which supplies the 30 volt d.c. tripping circuits, and to a 240/110 volt rectifier which provides 110 volt d.c. for the main circuit-breaker solenoid. Other facilities fed from this 230 volt single phase system are the "on-off" and "isolated" indicating lamps associated with the circuit-breaker, and the control and timing circuits.

Water System

The water system is shown diagramatically in Fig. 4. It will be seen that the whole system is effectively a three-circulation interlinked closed circuit arrangement. The primary circuit comprises the boiler and the storage tanks, while the two secondary circuits are the space heating and domestic hot water systems, the latter being "closed" by the provision of local calorifiers. Adjustment of the temperature in the secondary circulation system is by means

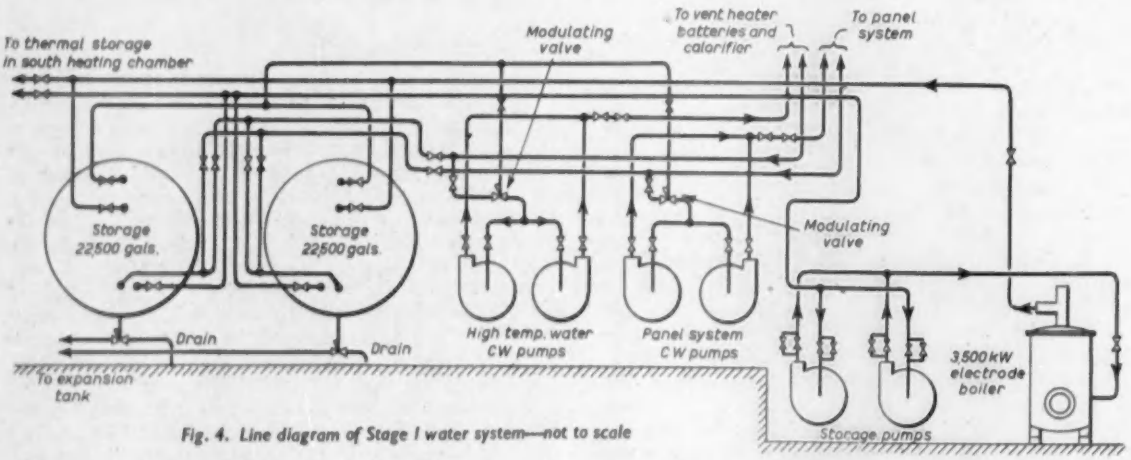


Fig. 4. Line diagram of Stage I water system—not to scale

Fig. 5. Main control desk in central control room

of mixing valves, which feed a proportion of the stored hot water from the top of the storage cylinders into the building heating circulation. An equal proportion of the returning cold water from the building circulation is diverted to the bottom of the storage cylinders where it remains unmixed with the stored hot water above it.

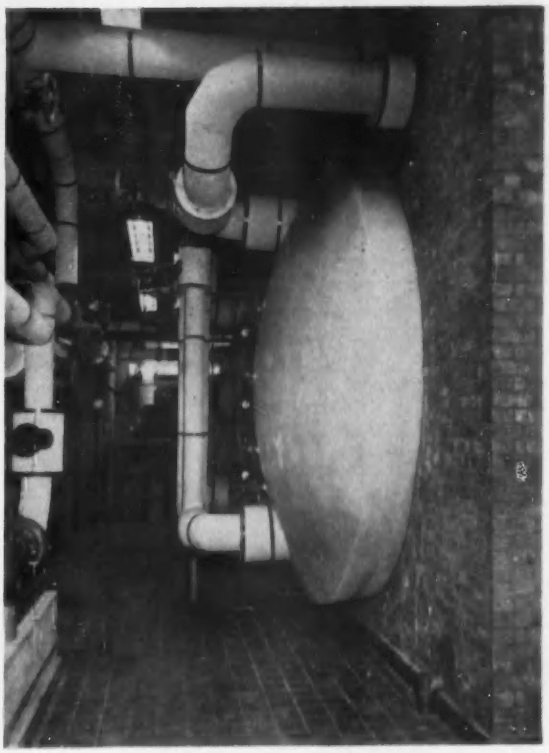
An expansion tank for the two interlinked heating plants is located in the Senate House Tower at a level of 112 ft above ground. This enables water to be stored at a temperature of 290° F without the production of steam. Working temperatures are maintained below this figure and the safety thermostat on the boiler is set to operate at about 270° F.

The maximum flow temperature in the space heating systems is about 120° F, but for average weather conditions a temperature of 90° F, is more usual. The calorifier hot water system, however, operates at the higher temperature of about 160° F.

Boiler System

The boiler at present installed is made by Sulzer Bros. (London) Ltd., and has a maximum capacity of 3,500 kW and is designed to operate on a 3-phase 11 kV 50 c/s supply. A working pressure of 65 lb/sq in. has been used in the design of the boiler shell, although the hydraulic test has been taken up to 130 lb/sq in. As with most electrode boilers, the actual operating temperature must be held some degrees lower than the theoretical boiling point due to the necessity for establishing the necessary temperature gradients between the electrode surface water and the bulk of water. In this particular installation, some 25° F must be allowed. This comparatively small temperature difference has been attained by the use of a "built-in" circulating pump which ensures that a continuous flow of water is rapidly passed over the electrode assemblies. The pump is located within the base of the boiler shell, and is driven by an external 8½ h.p. motor. It accepts the incoming feed water and ejects it through three internal pipes which have their outlets directly below the electrodes.

The boiler operational height, which is some 24 ft, determined the maximum depth of excavation, and a rectangular pit has been made capable of accommodating the ultimate requirements of three units. To save excavation costs, however, the cylinders holding the storage are mounted horizontally at a higher level, the top of their foundation block being some 7 ft above that of the boiler pit. The overall height of the boiler is about 19 ft 6 ins., and the diameter over the lagging is 5 ft 7½ ins. Extra



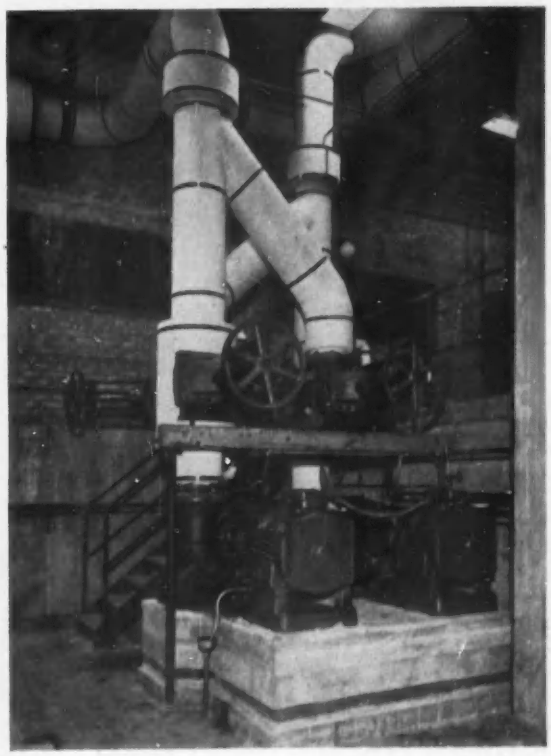
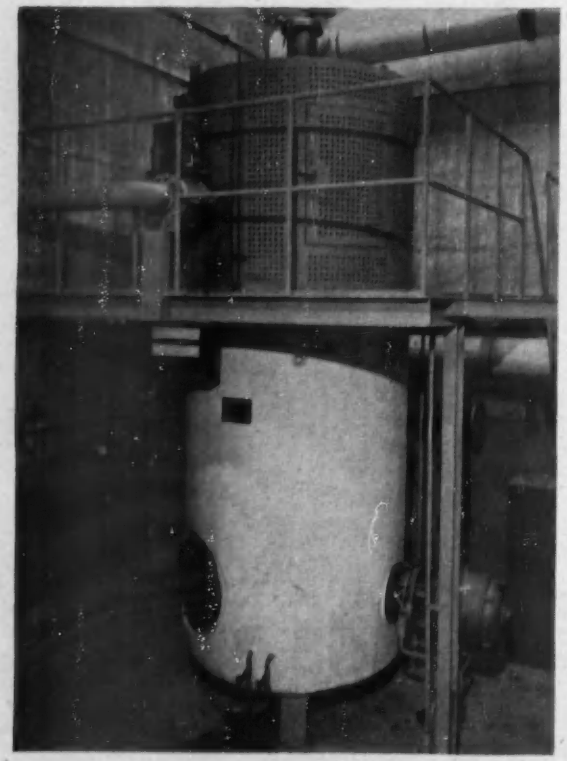


Fig. 6, top, shows the dished ends of main storage cylinders, with below, Fig. 7, a view of the primary circulation pumps which have sufficient capacity for the final scheme



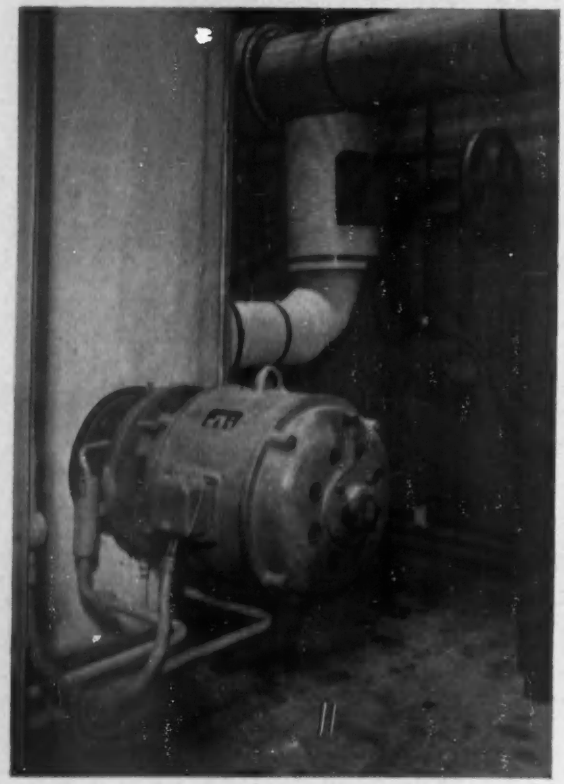


Fig. 8, top, shows Sulzer 3,500 kW electrode boiler installed in north heating chamber with below, Fig. 9, internal circulating pump motor for Sulzer boiler

headroom is allowed above the boiler for the inspection of electrodes and shields.

The output of the boiler is governed by the position of moveable insulating tubes which expose or shield the electrodes within the boiler. By raising these tubes the load is increased while by lowering them the load is reduced. Operation of this system is by an oil-powered servo motor mounted at the top of the boiler. The insulating tubes are attached to a piston rod which passes through a gland on the top of the cast iron water outlet bend. The piston rod has at its upper end the actuating piston which operates in a closed cylinder, the rod passing downward through a sealed gland. Oil is admitted to both sides of the piston, movement being imposed by the introduction of pressure differential between the two sides. This differential is, in turn, provided by the operation of magnetic valves included in the oil pipelines, and the valves themselves are under the control of the load control relay. Should the automatic load control fail, the servo motor piston can be raised and lowered by means of a four-way valve which provides for the necessary injection and abstraction of oil from the sides of the piston. A moveable indicator provides a direct reading of the position of the piston and, consequently, of the electrode shields.

Should, under hand control, the boiler be adjusted to a specific load, as the temperature rises this load will increase without the need for further movement of the control shields. This phenomenon results from the change in resistance of water with temperature.

An interlock ensures that the main supply switch cannot be closed unless the electrode shields are in the "minimum load" position and similarly (except by operation of the protective gear) the electrode shields are brought automatically to their "minimum load" position before the main switch can open. Thus the switch duty is generally restricted to some 20% of boiler full-load rating.

The load control relay on the local control board is set by hand, and the load which the boiler will take during any particular run is thus determined. The control thermostats are set at the desired maximum storage temperature and operate to shut down the plant when that temperature is reached. As far as the secondary circuits are concerned control of flow is excercised by thermostats in the flow pipework which governs operation of the mixing valves.

Control Panel

A local control board has been installed in the heating chamber. This at the moment consists of three panels, one concerned with the boiler itself, and the other two of common application. The boiler panel includes indication of phase amperes to each electrode, boiler flow and return temperatures, earth leakage ammeter, pressure at inlet and outlet of the boiler internal pump and boiler pump amperes. Six indicator lamps on the associated desk panel give indication of earth leakage, overload, excess temperatures, boiler "on," boiler "off" and boiler pump running. All these are red with the exception of boiler "off" which is green. A control knob, connected with the control relay allows the boiler loading to be set at any point from 20% to 100% of full load. Emergency trip and control "on" and "off" switches are also provided. The other two panels deal with the water circuits and the auxiliary plant. They indicate the current being taken by the storage pumps (2), the oil pumps (2), the "panel" or low temperature pumps (2), the high temperature pumps (2) and the sump pump. Pressure gauges are provided for the inlet and outlet sides of the storage pumps, the panel pumps and the high temperature pumps, while temperature readings are given of secondary flow (storage), panel flow and return

and high temperature flow and return. On the associated desk panels are all the pump starting switches and a switch for automatic timing control for a limited run.

Certain of the indications, particularly those associated with flow and return temperature and operation of the mixing valves are brought back to the main control centre in the Senate House to a supervisory desk. This desk also includes summation readings of the d.c. loading of the room themostats as well as providing remote temperature indications of the space heating at selected points of the buildings being supplied. The d.c. reading of the thermostat load has been found particularly useful in presenting an overall picture of the heat demand of the building. Control of both h.t. and panel temperatures is also provided at this desk which shows operation of any protective gear.

Operation

It might be thought that full thermostatic control of the boiler would suffice without the refinement of a large predetermined load setting. In view, however, of the large storage capacity available, and the great variations in load demand this is not necessarily so. The space heating demand is continuous—a feature of embedded ceiling systems—and the boiler therefore meets a night's space heating loads in addition to supplying heat to raise the stored water temperature to its maximum. It is essential to start the day during very cold weather with a fully "charged" storage, and the same holds to a lesser degree to other times. By setting the load taken by the boiler in accordance with the known residual heat storage at the start of the night's run it can be ensured that maximum stored temperature is reached just before the time-switch exercises its master control over the operation of the plant. It is obvious that a short night's run on the boiler will leave the storage vessels partly depleted at 7 a.m., or involve a fresh start with the boiler for a further short run.

The boiler is generally started up by hand from the main control panel, although the sequence of operation is under full automatic control and in fact the whole system can be put under this control, starting up automatically and shutting down, either under thermostatic control or at predetermined times. The motors driving the pumps in the panel and hot water system are 5 b.h.p. squirrel cage motors, two per system with one acting as standby. The two primary circulation pumps are driven by 24 b.h.p. motors, and each is capable of dealing with the full output from two 3,500 kW boilers, they are thus able to handle the output of the final installation of three boilers. In addition there are the two oil pump motors for the control servo mechanism which again provide a complete standby supply, and finally a sump motor for surplus water extraction, which operates automatically depending on float level.

Our thanks are due to Mr W. S. Jordan, A.M.I.E.E., chief electrical engineer, and to the University authorities for the information given in this article. The main consultants for the work were Richard Crittall and Co., Ltd., the boiler and pumps were supplied by Sulzer Bros. (London) Ltd., lighting and wiring was carried out by Tyler and Freeman, motors and starters were by the General Electric Co., and main switchgear by A. Reyrolle and Co. Architectural design was by Adams, Holden and Pearson, the excavation and construction of the heating chamber being by Higgs and Hill.

Extending Supplies in New South Wales

WITH responsibility for supplying electricity throughout an area of 8,528 sq miles in New South Wales, the Northern Rivers County Council, which was only constituted in June 1952, is making great strides in reorganising the operation of the four undertakings which it took over. These comprised the Clarence River County Council, Richmond River County Council, Lismore City Council and Casino Municipal Council. The second annual report of the Northern Rivers County Council, covering the twelve months to 31st December last, reviews the progress which has been achieved and refers to some future plans.

Unfortunately, the undertaking suffered severely from the disastrous floods in February 1954, which affected both the plant, and the unit sales. The latter amounted to 83·4 million units—an increase of 3½%—there being 29,208 consumers, of whom the domestic and farm consumers averaged 1,800 units p.a. The Council operates four power stations, plus one emergency plant, the latest being the Koolkhan steam station where a further 7,500 kW turbo-alternator was commissioned last August. Another 8,500 kW set and a 95 klb/hr boiler are on order. The Nymboida hydro-electric station, which has been in operation since 1924, was almost completely shut down by the floods for three days, but was afterwards in full service. The original Armstrong Whitworth sets at this station are having new runners, the opportunity also being taken to overhaul the alternators. The Lismore diesel station also sustained considerable damage in the floods, the water being 18 in. deep at one time, submerging many of the diesel sets and covering most of the sub-panels on the main switchboard. In the outdoor substation, several of the oil circuit-breakers were under the flood waters, together with large numbers of transformers and 24 motors of various auxiliaries. In the task of reconditioning and making ready for service valuable assistance was given by engineers of the Brisbane City Council. At the Dorrigo station, a combined hydro and diesel plant, one diesel engine and two hydro turbo-alternators were submerged, and although these were quickly back in service when the water level dropped, both the latter have since had to be rewound. Another matter which worried the Council during the year was the question of adequate supplies of coal from the local colliery at Nymboida. To augment supplies, quantities of coal from the Maitland fields were purchased at about 40s. a ton above the cost of local coal. But with Federal and State assistance full investigation is now being made of the resources of the coal fields in the Council's area. The results of this are awaited as it will determine the extension of the Koolkhan power station.

For a further future project, investigations are being pushed ahead on the Nymboida River, initially covering the construction of the first of several dams, which has an estimated potential of 40 MW, but a preliminary estimate of the hydro-electric resources of the valley is put at about 100 MW.

With such a wide area of supply, considerable transmission and distribution line work is planned. Firstly, the main transmission line voltage is to be raised from 66 kV to 132 kV, and a new 132 kV line erected to replace the old No. 1 northern line. A good deal of work is in progress concerning the future planning of the 66 kV system, and orders have been placed for transformers and oil circuit-breakers for the six new 66 kV main substations which are being established.

Illuminating Engineers at Zurich

—RECORD ATTENDANCE AT 13TH SESSION OF INTERNATIONAL COMMISSION ON ILLUMINATION

A RECORD number of delegates attended the 13th Session of the International Commission on Illumination (C.I.E.) held at Zurich from 13th to 22nd June under the presidency of Dr Ward Harrison of the U.S.A. 28 countries were represented by 520 delegates. The programme of technical sessions was an extremely heavy one, some starting as early as 8.30 in the morning and some continuing until late at night. In addition the Swiss National Committee, who acted as hosts, had arranged a very full social programme which was greatly enjoyed by the delegates and ladies.

The delegates included not only lighting engineers, but electrical engineers from the supply side of the industry, architects, ophthalmologists, research physicists and representatives from government departments. The delegation from Great Britain (led by Dr S. English) was not only the largest ever, but also the largest at the conference.

I.E.C. Organisation

The Commission has no mandatory powers and is dependent for its existence on the good will of the lighting interests in the various countries who subscribe to its activities. The subjects studied vary from time to time according to trends within the industry; for example, when the study of a subject is completed or when the subject itself becomes obsolete it is removed from the list, but progress during recent years has been so rapid that there are always many more new subjects requiring consideration. In fact, the number of subjects is now becoming so great that it is generally recognised that it is impossible during the course of a meeting lasting 10 days or so to deal adequately with every one. A point of criticism about the meeting just ended was that so much material was available for inclusion in secretariat reports that only a small part of it could be included in the published papers and of that material only a summary could be presented at the actual meeting. These secretariat reports are intended to record progress and developments made on each particular subject during the period since the last meeting of the Commission (in this case since 1951). In addition to these reports a limited number of review papers are also given. These reports and papers form a very useful summary of world wide progress and are particularly useful to the smaller countries where lighting development is really only just beginning.

In large countries such as Great Britain and the United States over the last few years a sound basis of illuminating engineering has evolved and codes of practice have been prepared and are widely used; many of the smaller countries, however, not having the same facilities for research are now faced with the preparation of lighting codes and quite naturally turn to the larger countries for guidance. At the 1951 meeting in Stockholm all countries were recommended to study the basis of the British I.E.S. Code in preparing their own codes of practice; many countries have, in fact, done this during the last few years and have issued new codes or revised editions of former codes based very much on the British I.E.S. Code.

A new edition of the British code was issued in May and created considerable interest at Zurich. It is well known that recommended levels of illumination are much higher in the United States than in this country though the reason for this is not always fully appreciated. This point was discussed to some extent at Zurich where it was explained that American levels of illumination are based on a 98% visual performance efficiency whereas the British code is based on a 95% efficiency, the British argument being that to secure the small increase in visual efficiency means a doubling or trebling of illumination levels and is only justified where economic conditions permit, as would appear to be the case in the U.S.A. Mr H. C. Weston proposed that as the fundamental basis of levels of illumination is physiological, the C.I.E. should produce internationally agreed levels of illumination for different types of visual work but showing different levels according to the standard of visual performance required. Each country could then select the standard of performance it thinks fit to adopt and state this figure in its own code of practice. This, it was felt, would not only explain to the layman the different levels adopted in different countries but would also enable countries now tackling this problem for the first time to adopt a level of illumination which had some international basis. It was agreed that a working party be set up to prepare such tables before the next meeting in four years' time.

Industrial Applications

Industrial lighting is always a popular subject and the report at Zurich was the responsibility of the British committee. It would seem that developments in industrial lighting practice in other countries are very similar to those in Britain, the hot cathode fluorescent lamp becoming increasingly used in all countries. The question of maintenance of industrial lighting equipment is becoming a matter of concern. Though it is generally appreciated that better lighting in factories is an aid to increased production no figures to prove this have yet been obtained. This, however, is to be the subject of study during the next few years and it is hoped by the time the Commission next meets some factual information will be available.

Another specialised branch of industrial lighting is the lighting of hazardous or corrosive situations, a report on which was also prepared by the British committee. The subject has received some prominence during the last few years in Britain owing to the large number of oil refineries and large chemical works which have been built. All of these present special problems of lighting due either to the corrosive nature of the atmosphere or to the necessity for the use of flameproof equipment. (A paper on this subject was recently presented by Palmer and Harper to the I.E.S. in London.)

An example of the wide range of activities of the C.I.E. is given by the committee studying lighting for photography, television and cinema production. These are, of course, specialised fields but important ones. The report itself described practice in television and cinema studios

in different countries and an interesting section dealt with lighting for colour television in the U.S.A. where the technique of both television and film studio operation is most advanced. Much of the discussion revolved around the question of colour temperature of lamps used for studio lighting; in film studios most of the film stock is now standardised at 3200° K and lamps of this colour temperature are now available for film studio use. It was suggested that television studios should also standardise on the same colour temperature in order to simplify lamp production. In reply to a question from a Yugoslav delegate who reported unsatisfactory pictures obtained when using fluorescent lamps in the TV studio, American and British delegates said that after a period of experimental use some years ago these lamps were considered unsatisfactory for television work.

Home and School Lighting

A report on home lighting was presented by Germany. There was a long discussion on the subject and an interesting point was made by a Swiss delegate who referred to the campaign by electricity supply authorities in Switzerland to encourage consumers to use larger source lamps, in this case emphasis being placed on the 100 W lamp. It was found that sales staff trained in the elements of illuminating engineering were able to convince consumers of the desirability of having more light and the campaign had met with considerable success. (The question of the proper training of sales staff or others who are in direct contact with consumers was a point which cropped up again and again throughout discussions on various subjects.) The need for convincing architects and builders of houses of the importance of adequate wiring circuits and sufficient socket outlets was recognised by most countries.

In the session dealing with school lighting the announcement that the ban by the French government on the use of fluorescent lighting in schools had now been lifted was warmly received. In discussing American practice it was reported that in the renovation of old schools, floating luminous ceilings had been found to be not only more practicable but also less expensive than renovating the ceiling and installing separate lighting fittings.

In the street lighting session a review of practice in various countries was given and many speakers showed slides of installations in different parts of the world. A number of papers were given in this session dealing with such matters as visibility, glare and the reduction of accidents.

Other subjects dealt with included colour of light signals, estimation of comfort in lighting, signal lights, predetermination of illumination and luminance, education in schools and colleges, light sources, colorimetry, colour rendering, automobile lighting, vision, glare and adaptation, basic quantities, vocabulary, photometry, and lighting practice in connection with mines, railways and docks, sports, hospitals, theatres, public buildings, shops, airfields, hotels, offices and floodlighting.

The complete proceedings of the meeting, including secretariat reports, papers and discussions will be published in due course by the C.I.E.

Future Work

The final plenary session was held on the afternoon of Wednesday, 22nd June, when recommendations of the administrative and technical committees were considered. The draft of the revised international lighting vocabulary was approved for publication subject to some slight amendments. Amongst the recommendations for work to be undertaken during the next four years the following were included: (1) that nomenclature or lamp designation be studied with a view to attaining international uniformity, (2) that problems arising as a result of mechanically interchangeable lamps, not being electrically interchangeable, be further studied, (3) that a working party be set up for the purpose of preparing a C.I.E. table of scales of illumination, (4) that international tables for the evaluation of direct discomfort glare be prepared, (5) that data be obtained on the effect of improved lighting on production and reduction of accidents in factories. There were also many other recommendations for future work of committees concerned with such matters as those mentioned above.

Also at this plenary meeting the administration of the Commission for the next four years was discussed. At the beginning of the meeting proposals had been put forward for a complete revision of the administration but it was finally agreed to continue with the present system though the Central Bureau now moves from America to France, the secretarial duties being taken over by Professor Yves Le Grand.

A particularly popular election was that of Dr J. W. T. Walsh, of Great Britain, to the office of President in succession to Dr Ward Harrison. Dr Walsh has been connected with the Commission ever since it was formed in 1921 and has held various offices. Dr Walsh's nomination was unanimously supported by all countries and very warmly applauded by the plenary session.

The next meeting of the Commission will take place in Brussels in 1959.

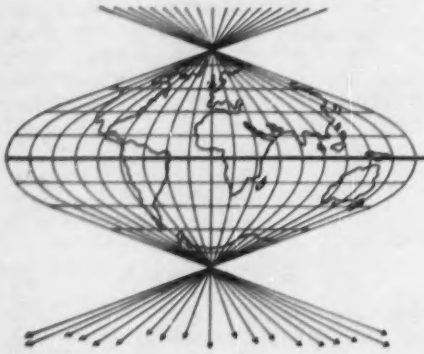
Power Statistics, 1954

A WIDE range of statistics relating to the supply of electricity is given in the "Ministry of Fuel and Power Statistical Digest," published last week. Although to some extent this duplicates figures given in the annual reports of the C.E.A. and the Scottish Electricity Boards, there are many additional figures likely to be of interest in any analysis of the industry. To give but one example, output capacity, maximum available capacity and an analysis of causes of loss of capacity, together with maximum demand figures and figures for load shed are given for two-monthly intervals back to 1952. An interesting figure here is that loss of capacity due to breakdown reached a new high level of 1,835 MW on the September/October 1954 day of maximum capacity.

Although this particular table gives full details of 1954, the Digest does not in general anticipate the C.E.A. annual report, and consequently it stops at 1953 figures. with full comparison with earlier years.

The coal section of the Digest goes into considerable detail as to supplies to power stations. Of the 37·9 million tons supplied during the 12 months ended 30th October, 1954, 24·35 million tons was in the "uncleaned slacks and smalls" class—no less than 64%, while another 26% was classed as "cleaned slacks and small." The East Midlands division of the N.C.B. was by far the largest supplier for power stations, delivering a total of 12·3 million tons. Next in order came the South Western division, with 4·8 million tons supplied.

Increase in the use of electricity in coal mines is apparent in other tables. In June 1954, there was a total of 2·1 m h.p. of electric motors installed underground, and 1·5 m h.p. installed above ground. Of the motors below ground, 0·56 m h.p. was used for haulage, and comparable amounts for conveyors and loading, and pumping.



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Alberta Station

Contracts have been placed by Canadian Utilities Ltd. for its new steam generating station to be erected on the Battle River, south west of Forestburg, Alberta, to which we referred on 5 May. The civil construction work is to be undertaken by Mannix-Gill Ltd. Initial capacity will consist of one 32 MW turbo-generator which is to be supplied by Brown, Boveri, of Switzerland, the associated boiler plant being provided by Combustion Engineering Ltd. Two more sets will probably be added at a later date. The station is to use low cost coal from adjacent strip mines.

Another B.C. Project?

The Provincial Government expects a recommendation from the British Columbia Power Commission shortly for a major power project in the Prince George area, Mr Bennett, the Provincial Premier stated a few days ago. We reported on 5 May that the Commission was seeking a hydro power site in the region to provide about 55,000 h.p. in the first stage of development.

Water Control

The International Joint Commission has been asked by the Canadian Government to discuss what benefits Canada should receive from the United States for hydro power generated in the U.S. with Canadian water. This announcement was made by Mr Lesage, Resources Minister, as the Commons began a detailed study of Government legislation tightening federal control over international rivers. The proposed legislation provides that anyone, including provincial governments, must obtain a federal licence before constructing dams in Canada on rivers flowing into the U.S. Such legislation would block the arrangements already noted, between the B.C. Government and the Kaiser Corpn. of U.S. for a dam on the lower Arrow Lakes.

EUROPE

Plant Orders

The Geneva firm Secheron S.A., and the Sprecher and Schuh A.G., Aarau, have received orders for the supply of technical equipment for the construction of a hydro-electric power plant at Picote on the Douro River in Northern Portugal. The first group of generators of this plant which, it is claimed, will be the largest in Portugal is scheduled to start operations in Oct. 1957. Secheron S.A. are to supply three generators with a capacity of 66,600 kVA each. Sprecher and Schur A.G. have received orders for the supply of the control room and the 15 kV indoor switchboard plant, in addition to a complete open-air 220 kV transformer station.

Loco Order

The French Société National des Chemins de Fer has ordered 29 electric locomotives from Switzerland, it has been announced. Brown-Boveri, Oerlikon, and Winterthur are the three companies which will supply the bulk of the order.

AFRICA

Congo Scheme

It is now revealed that the chief participants in the proposals for a large hydro-electric project on the Congo, to which we referred on 21 Apr., are the Aluminium Co. of Canada, and the Union Carbide and Monsanto Chemicals concerns. It is suggested that a power station could be erected in Inga in the Lower Congo, with a capacity of around 20,000 MW. Discussions on the scheme have been taking place recently in the Belgian Congo, from which it seems that local business interests are not particularly enthusiastic about it, feeling that the territory is not yet ready for such a big step forward in industrialisation.

MIDDLE EAST

Baghdad Take-over

Earlier proposals, to which we have referred, for the nationalisation of the Baghdad Light and Power Co.'s undertaking seem to be going forward. The shareholders of the company have now been informed by the chairman, Sir Kinahan Cornwallis, that the company is to transfer its undertaking in Iraq as a going concern for the sum of £2,400,000 sterling, subject to ratification, not later than 30 Sept. next. The chairman stresses that the terms of sale do not correspond with those the Board would recommend for acceptance in a freely negotiated sale between a willing seller and a willing buyer. In this case, the company is not, and never has been, a willing seller on the terms contained in the draft sale agreement. In addition to the £2·4 millions cash payment the Iraq Government is to pay in sterling in London sums equal to the cost, delivered in Baghdad, of all materials and goods ordered and received in Iraq on or after 1 Jan. last and sums equal to the total expenditure on construction and equipment of capital works on or after that date. The company's power station in Baghdad has an installed capacity of 41,000 kW.

Loan for Development

The International Bank for Reconstruction has agreed to make a loan of £9,600,000 for the construction of irrigation and hydro-electric projects on the Litani River, in the Lebanon. As we have already reported, the plan provides for exploiting the Litani River, together with the Jordan and the Yarmuk, to irrigate a wide area and to feed two power stations, one in Jordan and the other in Israel.

PAKISTAN

Funds for Development

A loan in various currencies, equivalent to $13·8m is being made by the World Bank to the Karachi Electric Supply Corporation to finance work on an extension of the power station, and improve transmission and distribution facilities. The loan is to be used to finance purchases abroad paid and to be paid after 1 Jan., 1954. We noted on 9 June that the K.E.S.C. proposed to convert its steam generating plant to use natural gas instead of oil fuel, and to install three 15 MW sets, in accordance with the recommendations of the consulting engineers, Brian Colquhoun and Partners.

Cable Manufacture

Originally formed in 1953, Pakistan Cables Ltd. is now being converted into a public company with an authorised capital of a crore of rupees (1,00,00,000) of which 45 lakhs are to be issued in 4,50,000 Ordinary shares of Rs. 10 each. The company was formed by British Insulated Callender's Cables Ltd., The Telegraph Construction and Maintenance Co. and Johnson and Phillips Ltd. to manufacture various types of power cables, including plastic covered cables and wire. Between them, those three

firms are providing Rs. 30 lakhs, more than half of which is on plant and machinery for the factory now nearing completion on the Sind Industrial Trading Estate near Karachi. B.I.C.C., who have been appointed technical advisers to the company, are to receive a fixed annual fee of £3,500, plus 6¼% of the net profits of the company. Initially, it is proposed to import the cable cores, but as additional plant is installed all stages of rubber cable manufacture will be carried out at the factory. The bare conductor output is expected to be about 1,200 tons per annum and the insulated cable output around 9 million yds per annum.

AUSTRALIA

Sets for Port Augusta

An order for two 60 MW turbo-alternators for a new power station at Port Augusta has been placed with the English Electric Co., Ltd., by the Electricity Trust of South Australia. The sets are for Port Augusta "B" station; it is likely that a third machine will be added later. Port Augusta "A" station, which went into operation about a year ago, is having three 30 MW Parsons turbo-alternators and six 175 klb/hr Riley Dodds boilers installed.

Melbourne's Report

An increase of 8·4% in units sold (265 millions) during the year ended 30 Sept. last, is recorded by the City of Melbourne Electric Supply Department in its annual report. It is estimated that over 3 million units were sold as the direct result of sales of new appliances, for it is noted that the emphasis is now placed on "service and advice to the consumer rather than on selling appliances simply for the sake of selling." During the year the sales of off-peak thermal storage heaters more than doubled, and the units sold for that purpose increased from 2 millions to 3 millions, but the full effect of the additional heaters is expected to be shown in next year's figures. At the Spencer St power station an additional 15 MW turbo-alternator was installed last July, and the station output increased from 93 million units in 1953 to the record output of 233 million units in 1954, which represent 83% of the undertaking's total requirements. Other plant has been modernised, thus reducing the cost of generation from 1·86d. per unit to 1·31d.

Trevallyn Starts Up

The first 28,000 h.p. turbo-generator at the Trevallyn power station of the Hydro-Electric Commission of Tasmania was put into operation a few days ago. A second similar machine is now undergoing tests preparatory to being placed on load. A further two sets are to be installed to meet the requirements of the Aluminium Production Commission. A 75 ft high concrete dam has been constructed at the narrow downstream end of Second Basin on the South Esk, forming a lake 3 miles in length. To conduct the water to the power station, a tunnel 21 ft 6 in. in dia. has been driven. At the lower end the tunnel branches into four penstocks. The plant operates on a static head of 415 ft, the water being discharged to the Tamar River.

NEW ZEALAND

Restrictions Again

All power supply authorities in the North Island have been instructed to impose a 11% restriction on electricity supplies to consumers during the coming year. This direction has been sent out by the State Hydro-Electric Department in an effort to limit the demand on the system during the present winter. In recent weeks, cold weather has caused the peak load in North Island to rise to more than 72 MW above the peak at the same time in the previous month. Part of the rise is attributed to the use of electric radiators.

Operating Results

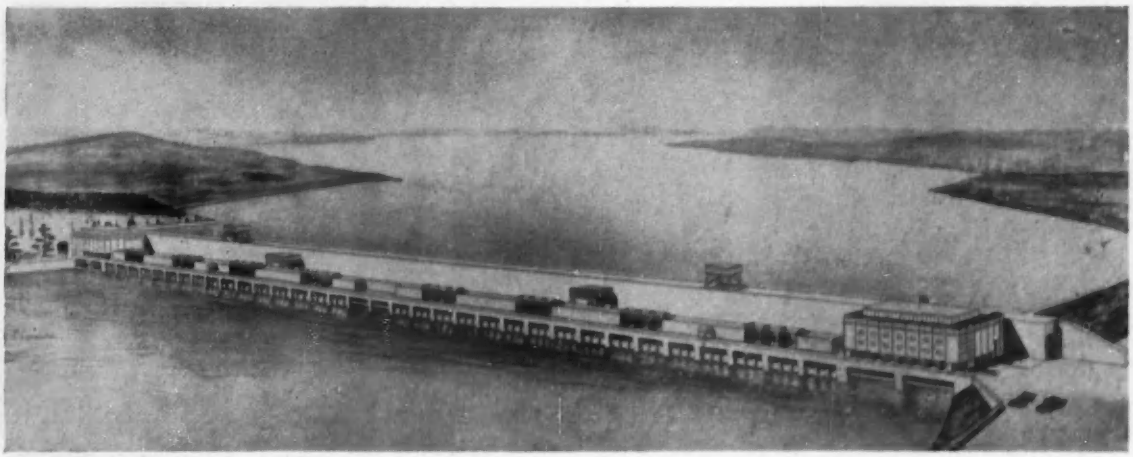
After providing for all charges, including loan repayments, the North Auckland Electric Power Board, New Zealand, has ended its year of operations with a surplus of £16,153, which, although much lower than for the previous year, is considered as reasonable by Mr S. P. Day, the secretary, in view of increased expenditure, and the higher discount to consumers for prompt payment.

FORMOSA

Power Expansion

Considerable expansion is taking place in the generating capacity of Formosa, largely with the assistance of American funds and equipment. Within the past few weeks two 10 MW steam turbo-alternators have been placed in commission, at Patoutze, Keeling, raising that station's capacity to 55 MW. At Tungmen, on the east coast three 7,000 kW sets should be running this month, while a new steam station with an ultimate capacity of 200 MW is under construction at Kaohsiung. Work is also to begin later this year on a 120 MW hydro-electric scheme at Shihmen, near Chungli.

Illustrated below is an architect's perspective of the international St Lawrence power house which will span the channel of the St Lawrence River between the eastern end of Barnhart Island and the Canadian shore, as it will appear when completed in 1960. The whole station will have 32 generators, 16 in the New York Power Authority's half, and 16 in the section of the Hydro-Electric Power Commission of Ontario, giving an aggregate capacity of 2,200,000 h.p. The sets will operate on an average head of 83 ft. For the Ontario section orders have been placed with the John Inglis Co., of Toronto, the Canadian associates of the English Electric Co., Ltd., for sixteen 75,000 h.p. fixed propeller-type water turbines, eight generators being provided by the Canadian General Electric Co., and eight by the Canadian Westinghouse Co., the first of which is scheduled for operation in the summer of 1958. For the U.S. section the General Electric obtained the order for the sixteen generators, while eight hydraulic turbines are being supplied by the Allis-Chalmers Manufacturing Co., Ltd. The complete power house, which will have an overall length of 3,300 ft, will be bisected by the International Boundary. Of the modified outdoor type, the power house will have no conventional-type structure over the generator room, but the sets will be protected by removable housings



Personalities

IN THE INDUSTRY

Mr H. Armitage, A.M.I.MECH.E., GRAD. I.E.E., A.M.INST.F., has been appointed deputy station superintendent at Radcliffe and will take over his new appointment on 1 Aug. Formally shift charge engineer at Poole, Mr Armitage received his technical education at Sheffield University and later at Bradford Technical College. He has also held similar appointments at Bradford and Halifax Generating Stations.

Chief accountant to the South Eastern Electricity Board, **Mr E. Sinnott,** F.I.M.T.A., F.S.A.A., has been elected vice-president of the Institute of Municipal Treasurers and Accountants.

Previously with the Automatic Coil Winder and Electrical Equipment Co., Ltd., for ten years, **Mr A. F. C. Williams** is joining the British Central Electrical Co., Ltd., on 11 July as personal assistant to the managing director.

At the Commemoration Day graduation ceremony at Glasgow University last week, honorary degrees of Doctor of Laws were conferred on **Mr C. W. Marshall,** B.SC.(ENG.), M.I.E.E., formerly controller of the South West Scotland Division, C.E.A., and **Prof M. S. Blackett,** M.A., Professor of Physics at London University.

Area commercial officer for the Fife area of the South of Scotland Electricity Board, **Mr J. Burnett,** was recently presented with a long service award by **Mr C. H. A. Collyns,** the area manager, in recognition of his 35 years' service in the industry.

Now manager of the Dublin sub-office of Metropolitan-Vickers Electrical Co., Ltd., is **Mr J. W. Jackson,** but **Mr T. J. Horgan** remains the company's adviser in Eire. Mr Jackson received his technical education at the Manchester College of Technology and was apprenticed to Mather and Platt Ltd. He joined the Metropolitan-Vickers' Motor Sales Department in 1929 and, after two years attached to the Sheffield district office, returned to Motor Sales in 1932. Since 1936 he has been at the company's district office in Glasgow. Mr Jackson is a member of the Association of Mining Electrical and Mechanical Engineers.

Appointed as station superintendent at the new Wakefield "B" power station, Yorkshire Division, C.E.A., is **Mr T. C. Ridings,** A.M.I.MECH.E., who since August 1951 has held a similar position at the Division's Whitehall Road, Leeds, power station. Earlier, he was for a short time senior assistant engineer in the South Eastern Division's Generation Construction Department, after station superintendent at Littlebrook power station for nearly three years. Educated at Bolton Municipal Technical College and Manchester College of Technology, Mr Ridings gained early training with Hick, Hargreaves and Co., before joining the Manchester Corporation undertaking in 1935. Three years later he became relief charge engineer at Barrow-in-Furness and in 1939 went to Bradford as shift charge engineer. There followed six years with the Bedford Corporation Electricity Department as deputy power station superintendent before going to Littlebrook as station superintendent.

President and general manager of the Canadian Marconi Co. since 1951, **Mr S. M. Finlayson** has been nominated as president of the Montreal Board of Trade.

20th Century Electronics have appointed **Mr Derek C. Shaw,** A.M.I.E.E., to their senior technical staff. He joins the firm from the Inspectorate of Electrical and Mechanical Equipment at the Ministry of Supply, Chislehurst. While there he served with the Inter Services Standardisation Committee. Previously, he was with G.E.C. at Hammersmith and Perivale in charge of quality control and has been for many years associated with valve production.

Mr S. C. Sullivan, of Saxtead, has been appointed electricity service manager at Framlingham, to the Eastern Electricity Board, in succession to the late **Mr C. F. Hopes. Mr E. Hammond** has been nominated sales representative.

The triennial award of the Coopers Hill War Memorial Prize and Medal has been made by the Council of the Institution of Electrical Engineers to **Mr D. McDonald,** B.SC., A.M.I.E.E., for his paper on "The Electrolytic Analogue in the Design of High-Voltage Power Transformers."

The South Wales Electricity Board have appointed **Mr F. M. Watson** as district commercial manager of the District No. 346 (Rhondda). He was previously first assistant district commercial manager of the 223 District (Swansea area). Mr Watson succeeds **Mr H. B. Holloway,** B.SC., A.M.I.E.E., who, as we have already noted, has now taken charge of the Industrial Supply Section of the Commercial Department in the Board's Central Sub-Area at Cardiff.

Mr A. Alan Brown has been appointed senior assistant at the Queen St, Morley, service centre of the Yorkshire Electricity Board. He was formerly at the Board's Leeds offices, and succeeds **Mr G. Grainge** who has taken up a similar post at Peterborough.

Mr J. Johnson Smith, M.I.E.E., director of the Electric Construction Co., Ltd., leaves London Airport on 5 July for a ten-day visit to Canada, where he will have consultations regarding sales problems and prospects with the managing director and engineers of the associate company, E.C.C. Canada Ltd., Toronto.

Dr J. W. T. Walsh, O.B.E., M.A., D.SC., M.I.E.E., has been elected president of the International Commission on Illumination. Although he retired from the position of senior principal scientific officer of the Electrical Department of the National Physical Laboratory in 1951, Dr Walsh still takes a very active interest in electrical matters particularly illuminating engineering. He has served on many Government Committees dealing with various aspects of illumination.

Mr A. F. C. Williams

Mr J. W. Jackson

Mr D. C. Shaw

Dr S. Whitehead

Mr S. J. Clifton

Mr M. F. Billimoria

On 2 July **Mr E. J. Leaver,** manager for Carron Company, leaves for South Africa, where he will visit the works of Carron Company's subsidiary, Carron Company (South Africa) Ltd., at Germiston, near Johannesburg, and the company's agents and customers in the Union and in Rhodesia. Mr Leaver's visit is in connection with the progress and expansion of the subsidiary.

Mr M. F. Billimoria, who acted as manager of British Insulated Callender's Cables Ltd. in Karachi, Pakistan, has relinquished that position this month after 25 years. He is now representing Ward and Goldstone Ltd., and Bill Switchgear Ltd., in Pakistan, we understand.

Dr S. Whitehead, M.A., D.SC., M.I.E.E., F.INST.P., Director of the Electrical Research Association, has been re-elected chairman of the Committee of Directors of Research Associations for a further year. Dr Whitehead has been director of the E.R.A. since Jan. 1946, having originally joined the Association in 1925.

A few days ago, **Mr S. J. Clifton,** M.INST.F., a senior sales executive of George Kent Ltd., left for Malaya by air on the first stage of a tour of overseas markets. He expects to spend three or four days in Malaya and will then proceed to Sydney, Australia, where he will work with the firm's New South Wales branch company, Davies-Kent Pty. Ltd.; and later with George Kent (Victoria) Pty. Ltd., in Melbourne. He will also spend time in Adelaide and Brisbane with the company's agents. He is to return via Canada where he will have discussions in Vancouver and Toronto.

Mr C. G. P. Pritchett has been appointed chief engineer of Chloride Batteries Ltd. in succession to the late Mr C. P. Lockton.

District commercial engineer at Rugby to the East Midlands Electricity Board for several years, **Mr A. Franklin** is to retire on 9 July. He has served with the Rugby undertaking since 1918.

Mr Harold M. Turner has been elected chairman of the board of the Canadian General Electric Co., Ltd., and **Mr James H. Goss** has been nominated as president. Mr Turner, who has been president of the company since 1946, is now responsible primarily for top-level public and government liaison. Mr Goss has had a wide range of experience in the electrical manufacturing industry and recently held high executive appointments with the General Electric Co. in Louisville, Kentucky.

Engineer in charge of telephone and telegraph maintenance services in the Wrexham area since 1931, **Mr Harry Wagg** has retired after 42 years' service with the Post Office.

Managing director of British Acheson Electrodes Ltd., **Mr W. B. H. Gallwey** has also been appointed managing director of Union Carbide Ltd., and has been elected a member of the board of Gemec Ltd., and appointed its managing director.

Miss Ruth Oliver has been appointed a director of Oliver Pell Control Ltd.

Mr R. F. Hatto, sales director of Wolf Electric Tools Ltd., is a director of the new Australian company just formed in Sydney by that concern. The directorate of the new sales company also includes **Mr D. K. Nicholas** as chairman, **Mr C. F. Macdonald,** as managing director, and **Mr B. E. Nicholas,** who are all resident in Australia and have been connected with the sales of Wolf tools for many years.

At the tenth A.D.A. Gold Tournament held at the Temple Golf Club, Horley, Nr. Maidenhead, on 23 June, the winner of the Horace Clarke Cup Match—the chief event of the day—was **Mr H. Powell** (High Duty Alloys Ltd.). **Mr A. K. Jordan** (Northern Aluminium Co.) was the runner up and **Mr A. J. Aston** (T.I. Aluminium Ltd.) third. A foursome competition was won by **Mr W. Scott-Warmer** and **Mr H. Powell,** both of High Duty Alloys Ltd. The putting competition resulted in a tie between **Mr W. Moulding** and **Mr E. A. G. Liddiard,** both of Almin Ltd. who tossed a coin to make Mr Moulding the prizewinner.

I.E.E. AWARDS

THE Council of the Institution of Electrical Engineers has made the following award of premiums for papers read or accepted for publication during the Session of 1954-55.

GROUP A. Institution Premium to *D. M. MacKay,* B.SC., PH.D.; Kelvin Premium to *H. I. Andrews,* PH.D., M.SC.; John Hopkinson Premium to *M. J. Kelly,* PH.D., D.ENG., D.SC., LL.D.; *Sir Gordon Radley,* C.B.E., PH.D.(ENG.); *G. W. Gilman,* M.S., and *R. J. Halsey,* B.SC.(ENG.).

GROUP B. (*Non-Section Premiums*): Ayrton Premium to *A. Rosen,* PH.D.; Llewellyn B. Atkinson Premium to *R. W. Palmer;* Extra Premium to *Professor G. W. Carter,* M.A.

Measurements Section Premiums.—Silvanus Thompson Premium to *D. Edmundson,* B.SC.(ENG.); Mather Premium to *Professor F. Brailsford,* PH.D., WH.SCH., and *C. G. Bradshaw,* B.ENG.; Extra Premiums to *Prof. H. E. M. Barlow,* PH.D., B.SC.(ENG.); *M. E. Haine,* M.SC.; *M. W. Jervis,* B.SC.TECH., and *J. C. West,* PH.D., B.SC.

Radio Section Premiums.—Duddell Premium to *E. G. Rowe,* M.SC.; *P. Welch* and *W. W. Wright,* B.SC. Ambrose Fleming Premium to *P. E. Axon,* O.B.E., M.SC., PH.D.; *C. L. S. Gilford,* M.SC., and *D. E. L. Shorter,* B.SC.(ENG.). Extra Premiums to *H. Page,* M.SC.; *G. D. Monteath,* B.SC.; *M. W. Gough,* M.A.; *R. C. Glass,* B.A., B.SC.; *G. D. Sims,* M.SC., B.SC., and *A. G. Stainsby,* B.SC.

Supply Section Premiums.—Sebastian de Ferranti Premium to *G. F. Peirson, A. H. Pollard,* B.SC., and *N. Care.* John Snell Premium to *E. W. Golding,* M.SC. TECH. Extra Premiums to *J. Christie, H. Leyburn,* B.SC.(ENG.); *J. F. Bird,* M.C., T.D., B.SC.; *J. L. Ashworth, J. S. Hall,* B.SC. TECH., and *A. H. Gray,* M.SC.

Utilization Section Premiums.—Swan Premium to *Professor F. C. Williams,* O.B.E., D.SC., D.PHIL., F.R.S. and *E. R. Laithwaite,* M.SC. Extra Premiums to *H. W. Wolff,* B.SC.; *T. G. F. Atherton,* B.A., and *W. Holttum,* M.ENG.

GROUP C. Blumlein-Browne-Willans Premium to *N. W. Lewis,* PH.D.(ENG.); Fahie Premium to *J. M. C. Dukes,* M.A.; Heaviside Premium to *J. W. Lynn,* M.SC.; Paris Exhibition (1881) Premium to *J. A. Broughall,* B.SC.(ENG.), and *K. J. Cook,* O.B.E.; Webber Premium to *W. E. Willshaw,* M.B.E., M.SC.TECH.; *H. R. L. Lamont,* M.A., PH.D., and *E. M. Hickin;* Oversea Premium for Senior Members to *F. W. Roberts,* B.SC.(ENG.); Oversea Premium for Students and Graduates under 28 years of age to *M. W. Allen,* B.E.

Coopers Hill War Memorial Prize and Medal to *D. McDonald,* B.SC.

Students' Premiums to *T. E. Broadbent,* M.SC., B.SC.(ENG.); *G. D. Stairmand,* B.E.; *F. Szekely,* B.SC.(ENG.); *J. H. Banks,* B.SC.; *J. A. Bottomley,* B.SC.TECH.; *W. G. Bryce,* B.SC.; *J. Jardine,* B.SC.(ENG.); and *J. K. Wood,* M.SC.

Equipment for Industry

Conveyancer's New Truck

FOR the productivity conscious works manager is now offered a newcomer to the range of electrically powered mechanical handling equipment in the E2-20 battery electric fork lift truck which is capable of handling up to 2,000 lb. Made by CONVEYANCER FORK TRUCKS LTD., Warrington, Lancs, the E2-20 is particularly useful in view of its small size, being claimed to be the country's smallest rider-operated electric fork truck now available.

A three-wheeled vehicle, it is a re-styled development of earlier Conveyancer models with a design aimed at ensuring completely foolproof operation. For "inching" control at low speeds, the system employs the first speed switched in manually, with actual control of movement effected by the footbrake. The latter uses hydraulic transmission to the hub brakes, although the handbrake has a mechanical linkage. Dynamic braking

Conveyancer's E2-20 fork lift truck is a small but powerful vehicle

by controlled plugging is also incorporated to enable the truck to be reversed whilst in motion. Acceleration is automatic, the speed controller being time-regulated to safeguard the electrical equipment. Other features, including simple control arrangements and adjustable seat, are aimed at minimising driver fatigue, whilst access to all parts is stated to be readily obtained for routine maintenance purposes.

Precision Components

ALTHOUGH the resistor is such a commonplace component, its use, in light current control systems particularly, often requires a high degree of both accuracy and temperature stability. For such purposes, ELECTROTHERMAL ENGINEERING LTD., 270 Neville Rd, E.7, now offer the "Precistor," an accurate wire-wound resistor of outstanding stability, applicable in feedback and computer circuits, instrument shunts and equipment operating up to the upper limit of the audio frequency range.

"Precistors" can be supplied in values from 0·1 ohm to 1 megohm, having 2 W ratings, as standard components, although higher values and ratings can normally be supplied. Resistors up to 1 ohm value are adjusted to within ± 1·0%, from 1·0 to 10·0 ohms, to ± 0·5% and from 10 ohms upwards, to 0·1%. Stability of all values is high, each resistor, when taken through an operating temperature range of −60° C to + 105° C, stated to return to within ± 0·1% of its original value at 20° C. The upper temperature limit stated is that of its normal working range. Throughout the same temperature range, "Precistors" are stated to have a temperature coefficient of resistance as low as 0·002% per ° C. The shelf stability is also high, resistors showing less than ± 0·1% change after two years normal storage.

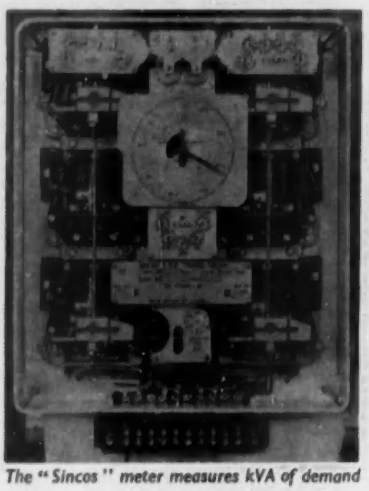
Tantalum Anode Capacitors

ANOTHER versatile and equally important component is the capacitor, of which, for electronic equipment, the electrolytic type is preferred in view of the small size of units with comparatively high capacitance. A recent contribution which should help to ease the equipment designer's problem is made by the TELEGRAPH CONDENSER CO., LTD., Acton, W.3, who have recently introduced a range of electrolytic capacitors with tantalum anodes for use under l.v., d.c. conditions.

Particularly suitable for low temperature use, or for long period operation where servicing has to be kept to a minimum, these capacitors employ a foil electrode to enable a non-corrosive electrolyte to be used, thus avoiding trouble to leakage resulting from mechanical damage. The use of tantalum also gives a good shelf life, without re-ageing after long periods of dormancy. Performance of the capacitors includes a p.f. of less than 8% from 20° C to 85° C for 12 V d.c. working and above, and a capacitance change of less than + 10% at 85° C and less than −33% at −50° C. Leakage current is stated to be 0·01 microamp/microfarad/volt after 10 mins. at working voltage, doubling for approximately every 15° C rise in temperature. Having a tolerance of ± 20%, capacitors are available for 6, 12, 25, 50, 100 and 150 V d.c. working, of up to 200 μF capacitance in the lower voltage range and from 1 to 15 μF in the highest.

Measuring Volt-Amps

TO meet the requirements of tariffs which involve the measurement of kVAh, SMITH METERS LTD., Rowan Rd, Streatham Vale, S.W.16, have recently introduced their "Sincos" meter designed to give simultaneous readings of kWh, kVArh, kVAh and kVA of maximum demand. This is achieved by using two polyphase meters series connected with the load under measurement. One meter is their standard cosine unit registering kWh, whilst the other is a kVArh, sine meter so arranged that a leading power factor does not cause reverse rotation of



The "Sincos" meter measures kVA of demand

the disc. Speeds of the discs are thus proportional to kW and kVAr respectively.

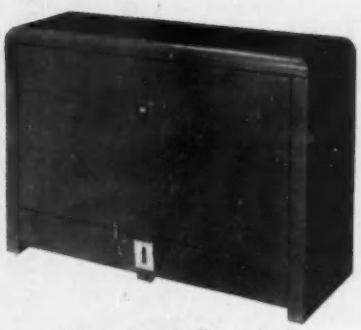
From this arrangement, it is a relatively simple matter to obtain kWh and kVArh values, effected by attaching counters to each meter rotor. To obtain values proportional to the actual kW and kVAr demand of the load, it is necessary to add together the squares of the speeds of each rotor and to obtain a resultant speed which is equivalent to the square root of this addition. The "Sincos" meter carries out this operation by a gear mechanism fitted between the two rotors. Basically, this mechanism comprises two sets of gears, each set rotated proportionally to its respective meter. Between the two sets of gears, and driven by them, are five separate interconnecting spindles, of which three are rotated additively by both meters, one by the sine meter alone and the other by the cosine meter alone. By this arrangement, there is at all times one spindle rotating proportionally to kVA, whilst the other four are moving more slowly. The output of each spindle drives, through a special one-way clutch, one of a set of five identical gear wheels, whose actual speed is that of the faster moving spindle, and hence proportional to kVA. One of the wheels is thus geared to the operating pointer of a "Merz" m.d. indicator showing the maximum demand in any one half hour, and another is geared to a counter to give an overall reading of kVAh consumed.

Thermodare in Five Models now

THE addition of two new models to their range of thermal storage heaters brings the number of models available from THERMODARE (GREAT BRITAIN) 79 Petty France, S.W.1, up to five.

The two new models are horizontal in design with an overall length of 22 in. These horizontal models are supplied in 1½ kW and 2 kW ratings at £14. and £15. each respectively.

The new standard 2 kW (Vertical type) is now priced at £15. but the price of the standard 1 kW and 1½ kW models remains unaltered at £11. and £12. 10s. respectively.



New horizontal "Thermodare"

Lumette Adjustable Lamp

NEAT miniature lighting fitting introduced by the ELECTRIC DEPOT LTD., Pritchett St, Birmingham 9, the "Lumette" has an infinite variety of positions using two ball swivel joints. Its simplicity of fixing and compact size enables it to be used in situations where a larger fitting would prove awkward. Fitted with a standard moulded lampholder, a maroon-coloured shade and with the arms plated, the Lumette costs 18s. 4d. list. (This includes 2s. 10d. purchase tax.)

New Synthetic Rubber Coating

SYNTHETIC rubber which is completely resistant to ozone cracking and which dispenses with the need for carbon black reinforcement is now being distributed by DURHAM RAW MATERIALS LTD., 1 Gt. Tower St., E.C.3.

Called "Hypalon" and perfected by the American Du Pont organisation the new material is of great value as a protective coating for a wide range of rubber goods and fabrics, it shows good adhesion qualities with rubber fabrics, paper, wood, concrete and metal (with primers if necessary) and is flexible at low temperatures, being effective at −65° F without plasticisers. Resistance to sunlight scuffing and abrasion is exceptional. In addition the material can be compounded in cement form in a wide variety of colours without any difficulty and it resists the effects of chemical action, particularly the oxidising acid group. It is heat resistant up to 250° F and in view of its many properties is of importance to manufacturers of insulated wire and cable, particularly as Hypalon lacquers can be applied as a thin coating to other rubbers by brush or spray.

"Dustette" Trade Mark

IN our issue of 2 June, on page 941, we referred to the availability of an extension piece for a hand vacuum duster. Inadvertently we referred to this appliance as a dustette. We have been asked to stress that the word "Dustette" is a registered trade mark of HOOVER LTD., and applies only to models of their make.

Individual Bed Lights

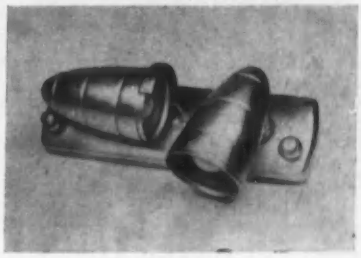
TRUCE in the battle between spouses and comfort for the inveterate reader in bed is afforded by the "Harmony-Lite" personal bed light introduced by VICTOR NORMAN (AUST.) PTY. LTD., St. Anne's Works, Uxbridge Rd, Hayes, Middlesex.

A neat smart piece of equipment to sell at £3. 7s. 6d. plus 12s. 4d. purchase tax, the Harmony-Lite consists of two separate hooded lights each with its own switch and adjustable to any angle. The fitting uses 15 W satin etched lamps and means complete peace for the sleeper and undisturbed reading without glare.

The lamps swivel together making a dust-proof entity not liable to damage when making the bed, for example. Covered spring clips on the felted back plate ensure fixing without marking even the most highly polished surface. The "Harmony-Lite" is made from aluminium with anodised finish in old gold, silver, pastel blue or shell pink. Screw holes are provided for wall mounting as desired, and ample flexible supplied.

For the Electrical Trade

The "Harmony-Lite" affords peace for both reader and companion sleeper



"Carefree"—the New Cooker by Creda

SPECIFICALLY designed for automatic cooking the new "Carefree" cooker introduced by SIMPLEX ELECTRIC CO., LTD., Blythe Bridge, Stoke-on-Trent, is not to be available in a non-auto version.

Very smart in its new shade of grey and cream or grey and white the Creda Carefree represents the most modern styling of a conventional electric cooker. Controls are mounted at eye level on a high splash plate which carries the hob light. On the top of this is a seat for a detachable ringer timer which may be detached to accompany the housewife about the house so that wherever she goes it will give warning.

One 8 in. plate, one 6½ in. plate and one 10½ in. × 8 in. grill boiler plate are fitted in the hob with solid plates as standard, radiant plates being interchangeable to EDA specification. Simmerstat control is standard on the 8 in. plate and available for the others. The hob is of the cast lift-off type and the grill chamber which has a counterbalanced drop-down door is of welded construction designed to retain spillage. The oven (3,050 cu in.) is well proportioned and designed for time clock control though its performance is first class when manually controlled. Draughts are excluded by a patented woven glass fibre door seal and ventilation effected by a special Creda feature—a tube which directs oven steam on to the splash plate through a port in the hob. Oven door opens through 180 deg. and closes with a smooth action cam latch. The warming drawer below the oven is heated by 400 W plug-in element, controlled by On/Off switch and is included in the timer control circuit. Price of the Creda "Carefree" is £50 complete.

The "Carefree" control equipment includes a clip-on ringer to fit on top of the back plate.

Summit Cleaners with TV Suppressors

RECENTLY SLOANE ELECTRICAL CO., LTD., 31 Bondway, Vauxhall, S.W.8, decided to incorporate radio and TV suppressors as a standard fitment in each of their Summit vacuum cleaners. Consequently they have revised their prices which are now quoted as under.

Cylinder model now £12. 10s. 0d. retail
Super Summit now £18. 7s. 6d. retail
Upright model now £17. 9s. 4d. retail
Hand cleaner now £9. 18s. 3d. retail

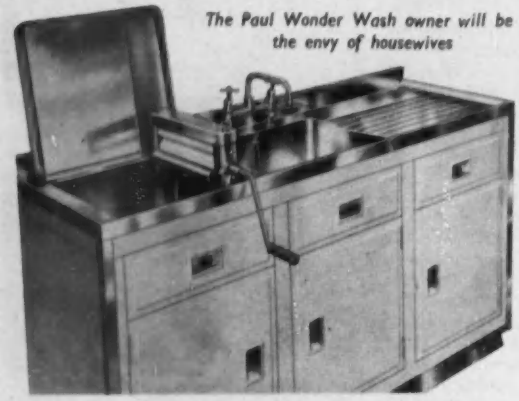
The cylinder model which was previously supplied with 2-core flex and a combined 2-pin plug/b.c. adaptor now has 3-core flexible cable fitted as standard.

The Paul Wonder Wash

FITTED kitchen equipment by W. H. PAUL LTD., Breaston, Derby, the dream of many a housewife, now includes two stainless steel sink units with built-in electric heated washing machines.

There are two models—the "Dovedale" a two compartment unit selling at £91. 10s. plus £14. 8s. 11d. p. tax and the "Millersdale" with three compartments selling at £107. 3s. plus £14. 8s. 11d. p. tax. Both models have the washing machine built into the left cupboard and brought into action merely by lifting the working top and raising the hinged wringer.

Main features of the washing machines are (*a*) capacity of 8 gallons of water—8 lb of dry clothes, (*b*) 4 minute maximum washing time, (*c*) ½ h.p. single phase motor drying die cast aluminium agitator, (*d*) 3 kW heating element, (*e*) a stainless steel folding wringer with 12 in. rollers which are spring loaded, and (*f*) simple control with only two switches, one for the motor and one for the heater which includes a pilot-light at the front of the cabinet in its circuit.



The Paul Wonder Wash owner will be the envy of housewives

TRADE PUBLICATIONS

METAL FINISHING.—Pyroclean No. 101 emulsion type cleaner is intended as a degreasing agent used in aqueous solution. A leaflet from The Pyrene Co. Ltd., metal finishing division, Great West Rd, Brentford, describes the product.

CONDUIT ACCESSORIES.—The new "Blaco" illustrated list No. 13 by F. C. Blackwell and Co. Ltd., Great Crosby, Liverpool 23, has been revised and brought into line with other lists in style.

DUST COLLECTION.—Pneumatic dust collecting and conveying is the subject of Publication 6507 superseding No. 6505 issued by Sturtevant Engineering Co., Ltd., Southern House, Cannon St, London, E.C.4.

RUBBER MOULDINGS.—An interesting booklet describing from start to finish the skilled business of producing a rubber moulding is available from Redferns Rubber Works, Ltd., Hyde, Cheshire.

SIRENS.—Carter and Co. (Nelson) Ltd., William St Works, Nelson, Lancs, have issued a list showing details of their petrol-electric sirens for emergency and industrial use.

BOOKS.—The 1955 catalogue of books on electrical engineering, radio and electronics is now available from H. K. Lewis and Co., Ltd., 136 Gower St, W.C.1.

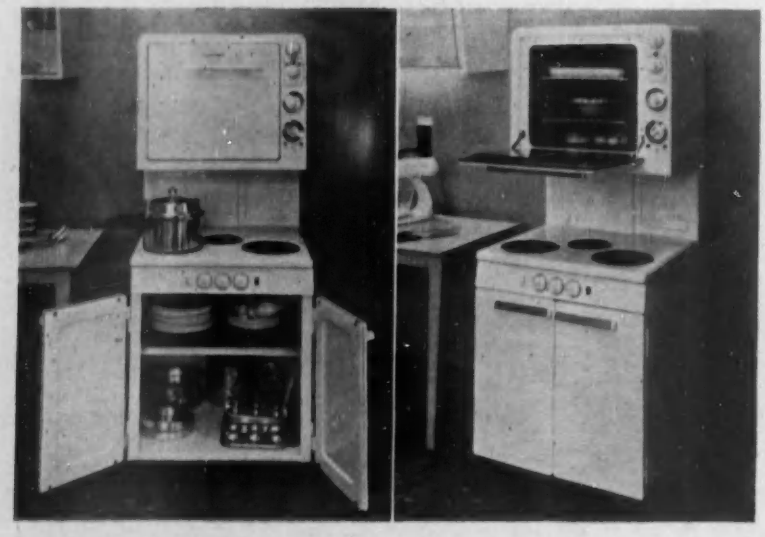
DIESEL ENGINES.—Paxman 7L diesel engines for rail traction are described in Publication No. 1408 issued by Davey Paxman and Co., Ltd., Colchester.

Heart High Cooker is English Electric latest

NO more backache—no bending, no stooping—Heart high oven with auto-time control—these are the important selling features of the startling new Model 2020 high level cooker just released by the ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.

Really revolutionary in design the "2020" has a chest high oven with drop down door and non-tip oven trays so that food in cooking can be easily inspected and the completed dish removed without that tiring stooping. Below this at hip height is the spacious hob with three radiant hot-plates, two 8 in. and one 6 in., all "Simmerstat" controlled. Beneath the hob and the fascia control panel is an exceptionally large hot cupboard which automatically switches itself on or off if required—an unusual feature of the "2020" and below that a valuable storage space.

The "2020" raised oven cooker has a booster grill which helps raise temperature of the oven to 400°F in 8 minutes



The heart high oven is big enough to cook a fair-sized turkey and has side and bottom elements plus the grill element at the top. This element is brought into use by means of automatic coupling switches to "boost" the use of oven temperature—an important innovation in electric cookers. The tried and trusted automatic oven timer first introduced in the 2011 cooker is built into the control panel on the right of the oven and above this are a ringer minute timer, the oven-grill booster control which cuts out the grill element when desired oven temperature is reached and above that the grill Simmerstat. On the hob panel are the three hotplate Simmerstats and hot cupboard toggle switch and pilot light. Finish is in wipe clean white or cream enamel with chromium handles and the price £70.

Though greater in width by 3½ in. and 2 in. depth than the standard cooker the "2020" weighs only 238 lb. compared with the 252 lb. of a conventional standard cooker. For a.c. mains only, voltages 200/210, 220, 230/240, and 250. Delivery at the moment is 7-10 days ex stock.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Parallel Currents

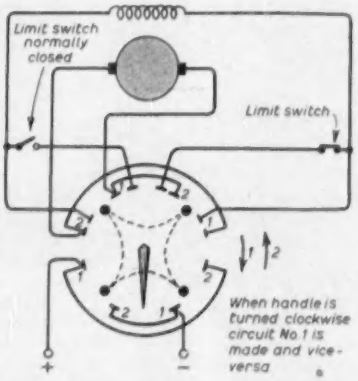
AN a.c. panel ammeter of our rolling mill motor failed to register. The cause of the fault was traced to an open circuit in the secondary winding of the instrument transformer but conditions did not allow for an immediate repair. As it was required that the current reading had to be logged, temporary means had thus to be provided for checking the current.

In accordance with the size of the material being rolled, the current varied from 250 to 550 A. A tong ammeter was available, but with a full scale reading of only 150 A. It was suggested that with the aid of the tong ammeter, current tests could be made with a number of cables connected in parallel in one of the lines supplying the motor.

The suggestion was carried out in the following manner. Four lengths of 7/16 v.i.r. cable of equal length were obtained and bared 2 in. at either end. A large terminal was connected to both ends of the cables, the arrangement providing a link between one of the stator terminals of the motor and main lead. The ammeter was then clipped round one of the four cables. In one of the tests the tong ammeter thus indicated 120 A, the actual motor current being 120 x 4 = 480 A.—*"Novis."*

Limit Switch Connections

DURING the annual overhaul of a factory power station I discovered a rather interesting fault. When the small d.c. motor operating the turbine governor was allowed to run until the limit switches operated, the motor, instead of stopping, speeded up and ran very fast until the governor operating arm struck the end-stop with a loud "clang." When this happened the motor reversed and ran just as fast in the opposite direction until the limit switch closed, whereupon the motor again reversed. All this without the control switch having been moved from the "Increase Steam" position.



Circuit of motor driving turbine governor, in which limit switch opening caused motor to race

Suspecting a weakened field, I traced out the circuit with a buzzer and obtained the circuit diagram shown. The trouble was then readily apparent. Motor reversal was effected by changing the direction of the field current and when either limit switch opened full voltage was still applied to the brushes, while a very weak field, due to residual magnetism, still existed. This accounted for the sudden increase in speed; perhaps some reader may explain the reversal and continued high speed in the opposite direction. I can only suggest that the abrupt stop caused the armature to reverse, the inertia of the system being great enough to overcome the very weak field. After changing over the armature and field leads at the motor no further trouble was experienced.—*J. G. Potter.*

Shocks from Water Tap

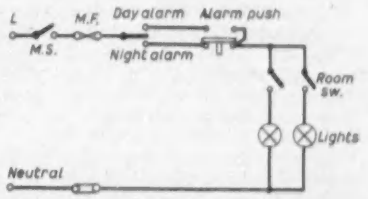
A COMPLAINT was received from the official in charge of a Remand Home for boys that his kitchen staff were receiving shocks from the running water at the sink while washing their hands. The premises had originally been a large residence or hall in the country, and had been converted for use as a school. Almost all the electrical appliances were in the kitchen, and as space heating was carried out by central heating method the rest of the hall was wired for lighting only.

There was no doubt about the shocks from the running water, and it was found that the shock could be quite severe if one hand was placed in the water from the hot tap whilst the other touched the cold water tap. On investigation it was found that the cooker was incorrectly earthed to the hot water system and that the grill boiler element was making contact to the frame of the cooker. It was obvious that this contact had been made by some maltreatment, but there was no evidence at the time as to how this had been effected. The element was replaced and the cooker correctly earthed to the cold water system, and I left the official who had contacted me very puzzled as he could not understand how the damage had occurred.

The sequel came a week or two later, when I received a telephone call from the above-mentioned official to explain that he had found out how the damage had been caused. Apparently, the boys had been secretly obtaining cigarettes, but had been unable to obtain matches, and as there were no fires in the building except in the basement—to which they had no access—they lit their cigarettes surreptitiously by slipping unseen into the kitchen and pushing the cigarettes up against the element of the grill boiler.

Visible Alarm

THE following simple circuit would be, I think, a help to people hard of hearing a door bell alarm inasmuch as it requires little alteration to the existing circuit. Instead of a bell being the signal the ordinary room light could be made use of by intermittent pressure on the door button. The only extras required are a 2-way switch and press to make-and-break push. The 2-way switch is used as a selector for day and night use and the local room switch made for the day alarm.—*W.A.*



Suggested circuit for a visible alarm system using the normal room lighting installation

Commutator Flat

AFTER being rewound, an old 110 V d.c. generator over which I am responsible gave considerable trouble in that a flat consistently developed on its commutator. Various cures were tried, including thorough regrinding with a good stone, the fitting of new brushes, and mica undercut, but within two or three weeks after grinding the flat would reappear no better than before. After thoroughly examining the comm., I made a bar to bar conductivity test, which showed a resistance reading of 0·01 ohm until the position of the flat was reached. Here it was 0·06 ohm. After scraping the varnish from the risers at this point, I found a bad joint on the lower armature conductor, which was resoldered. Since then the generator has run for six months without giving trouble.—*B.D.*

NEWS OF THE WEEK

I.E.C. Meetings in London

Thirty Technical Committees Have Business Sessions

BRITISH Standards House, London headquarters of the B.S.I., is to be the meeting place this week and next for some 650 delegates from twenty-five countries who are attending a series of meetings of the International Electrotechnical Commission. Between 28 June and 9 July, some 30 technical committees will hold nearly 150 half-day working sessions. Amongst the committees during the present session are those dealing with rotating machinery, radio-communication, terminal markings, switchgear and control gear, power converting equipment, h.v. insulators, aluminium, capacitors, lightning arresters, electrical accessories, primary cells and batteries, electronic tubes and valves and electro-mechanical and electronic components. In addition to the committee meetings, a number of technical visits have been arranged. These will cover both national institutions such as the Festival Hall, B.B.C. Television Studios, and the National Physical Laboratory, and firms in the electrical industry situated around London.

A full programme of social events has been arranged for the delegates. Principal events are a Government reception at Lancaster House, on 28 June; a reception by the I.E.E., attendance by the heads of national delegations today at the B.E.P.C. dinner at Brighton, a reception at London University and a banquet at Guildhall. The first Le Maistre Memorial Lecture will be delivered by Mr André Lange (France) at the Royal Institution on the afternoon of 5 July. At the Guildhall banquet the chair will be taken by Sir Roger Duncalfe, President of B.S.I., and the two principal toasts will be the "Lord Mayor and the City of London," proposed by Lord Waverley, a past-president of B.S.I., and "The International Electrotechnical Commission," proposed by the President of the Board of Trade, the Rt. Hon. Mr Peter Thorneycroft. The response will be made by Dr H. S. Osborne, President of the I.E.C.

New Exhibition Hall in Glasgow Store

AN exhibition hall has been opened on the third floor by Lewis Ltd., of Argyle St, Glasgow. The store plans to stage trade shows and other events sponsored by city organisations. First show to be held there was an electrical appliance exhibition in which each of eleven separate "rooms" ranged along the two walls were devoted to one firm's products. Firms represented were Fillery, Kenwood, G.E.C., Servis, Hoover, Bryterlite, Electrolux, Ada, Goblin and Parnall.

Group of three Firms will build Nuclear Power Stations

THREE companies representing steam, electrical and civil engineering, are to operate as a group to undertake complete nuclear power projects of the kind employing gas-cooled, graphite-moderated reactors. They are Babcock and Wilcox Ltd., the English Electric Co., Ltd., and Taylor Woodrow Ltd., who are already collaborating in the Government's 10-year nuclear power programme. Equipped to do everything from preparing the site to feeding power into the grid, the group will be looking for contracts in all parts of the world.

SUPPLY INDUSTRY'S INVESTIGATING COMMITTEE TO VISIT CARDIFF

NEXT Monday and Tuesday the Committee of Inquiry into the Electricity Supply Industry in England and Wales is to visit Cardiff to gain first-hand information on the activities of the industry in Wales. The meetings which will be public, are to be held at the Temple of Peace in Cathay's Park, beginning at 10.30 a.m. The decision to make a special trip to Cardiff follows the receipt of a number of memoranda from Welsh organisations, and the Committee concluded it would be best to interview the bodies concerned to gain a fuller understanding of Welsh opinion. The Committee was set up by the Minister of Fuel and Power almost a year ago, under the chairmanship of Sir Edwin Herbert.

Burnley Factory for Cooker Manufacturer

A TEN-ACRE site on the Heasandford industrial estate, at Burnley, has been acquired by Belling and Co., Ltd., for the erection of a new factory. Initially, we understand, one building will be constructed so that production can start at the earliest possible moment and thus relieve some of the pressure now centred on the company's Enfield works which has been operating at full capacity for a long time. Later an administrative block will be added to the first building and two more production units built on the site. Reports from Burnley state that work is expected to begin in Aug. and that production on a limited scale will follow late in the autumn.

Evershed Acquisition

IT was announced last weekend that Evershed and Vignoles Ltd. have acquired substantially the whole of the share capital of the Altrincham (Cheshire) firm, Record Electrical Co. The two companies will work in close co-operation.

C.E.A. negotiate Oil Supply for Seven Power Stations

A CONTRACT for the supply of fuel oil for seven power stations has been signed by the Central Electricity Authority and Esso Petroleum Co., Ltd. The agreement provides that the price to be paid for fuel oil delivered to the majority of the stations will not raise generating costs above those anticipated by the use of coal. Last July a similar agreement was signed for the supply of fuel oil from Esso's Fawley Refinery to Marchwood. The seven power stations scheduled for oil firing and involved in the recent agreement, are: Littlebrook, Tilbury, Barking and Brunswick Wharf, and Poole, Plymouth and Portishead, all conveniently situated for oil delivery from coastal tankers.

The decision to switch from coal to oil arises, of course, from the anticipated increasing shortage of coal. It is estimated that present consumption of some 37 million tons of coal at power stations will rise to 50 million tons per annum by 1960. In that year, consumption of fuel oil under the new contract will have increased to over 2¼ million tons or the equivalent of between four and five million tons of coal.

Dounreay Contract

A CONTRACT valued at between £250,000 and £500,000 has been awarded to James Scott and Co. (Electrical Engineers) Ltd. by the U.K. Atomic Energy Authority for electrical installation work at Dounreay nuclear power station. Needless to say the order was secured by the firm's Perth branch in the face of keen competition from other U.K. companies. A number of James Scott's employees are already working at Dounreay under a separate contract on accommodation for power station workers. They have been there for about three months.

STREET LIGHTING INDUSTRY WILL BE INVESTIGATED

AS we went to Press last week the Board of Trade announced that they had referred the supply of fittings for electrical street lighting to the Monopolies Commission. The reference excludes filament, discharge and fluorescent lamps used in street lighting, as these have already been covered in a previous report. This is the first of the five individual, and one general, references, announced by the President of the B.o.T. on 16 June. Those persons or organisations anxious to submit evidence relating to street lighting are invited to communicate with the Commission Secretary at 3-8 Cornwall Terr, Regent's Park, London, N.W.1. No mention has been made yet regarding the proposed submission of the other electrical subject, electric batteries.

In Defence of Battery Trade Associations

WITH the proposal by the President of the Board of Trade that electric batteries may be the subject of investigation by the Monopolies Commission, comes a defence of trade associations by Mr H. V. Schofield, director of Chloride Batteries Ltd. He was speaking at the Exide Service Convention at Scarborough. Mr Schofield said it had been suggested that co-operation between manufacturers constituted a monopoly. That was not the case in the battery industry. He agreed that the modern trade association was a compromise between the two extremes—nationalisation and chaos—the associations bridging the gap by providing efficient regulation of industry by voluntary co-operation.

Any suggestion of withdrawal from the British Starter Batteries Association or Association of Radio Battery Manufacturers, said Mr Schofield, was taking into account individual and comparatively minor difficulties, and overlooking the general advantages to trading. He emphasised that the battery associations provided a most valuable protection against a return to the chaos of the early 1930s in the industry.

Poplar impose Conditions on Tendering Contractors

CONTRACTORS submitting quotations to Poplar Council will have to give an undertaking in future that they will not follow practices criticised by the Monopolies Commission. A resolution to that effect was passed by the Council last week. The matter arose following the submission of tenders for the supply of fluorescent lanterns, control gear and lamps, when three firms each quoted £47. 15s. 2d. a set. The resolution applied to contractors for new buildings, but Clr A. C. Niederman pointed out that they were worried about other contracts as well.

INSTRUMENT INDUSTRIES EXHIBITION AT EARLS COURT

ON Tuesday the British Instrument Industries' Exhibition opened at Earls Court, London, and will remain open until 9 July. Owing to pressure on our space this week due to the B.E.P. Conference, we are unable to deal with the exhibition. We will, however, be giving a review of the more interesting products displayed in next week's issue.

More Efficient Power Stations Save £2¾m.

INCREASED efficiency of operation resulted in the saving of over 750,000 tons of coal in the C.E.A.'s power stations during 1954-55. This is equivalent to a saving in cost of nearly £2¾ millions. The overall average thermal efficiency of steam stations was 23·85% compared with 23·40% in the preceding year.

Of over 68,860 million units of electricity sent out from the steam stations in the period, more than one-quarter was provided by the 20 most efficient stations.

These 20 stations had an average efficiency of 28·74%, their individual efficiency percentages being:

Stations	*Thermal Effic. %*	*Stations*	*Thermal Effic. %*
Portobello H.P.	31·42	Barking C	28·45
Stourport B L.P.	30·83	Brighton B	28·40
Littlebrook B	30·49	Poole	28·31
Dunston B II.	29·74	Carrington	28·30
Bromborough	29·15	Keadby	28·28
North Tees C	29·05	Deptford East H.P.	28·06
Skelton Grange	28·89	Littlebrook C	27·93
Brunswick Wharf	28·70	Carmarthen Bay	27·88
Uskmouth	28·66	Huncoat	27·75
Brachead	28·59	Battersea B	27·71

CIVILS' CONVERSATIONE

THE annual conversatione of the Institution of Civil Engineers took place last week. The coincidental exhibition in the Institution's library contained a number of impressive models, some of which were of special interest to the electrical engineer even if they were not of a technical nature. The C.E.A.'s power station at Castle Donington was one of those models, and one of the largest shown. Another model depicted part of Allt-na-Laitige prestressed concrete dam being built in Argyllshire for the N. of Scotland Hydro-Electric Board. An exhibit of particular note was that showing the manufacture of the Transatlantic Telephone Cable and telescoped samples. There was a total of 28 stands.

Seventy-two members and guests attended the summer meeting of the I.E.E.'s Southern Centre at Hampton Court, where they were entertained by the Hackbridge and Hewittic Electric Co. at Walton. In the foreground of our picture are Mr A. E. Nicol, director of the company, Mr E. A. Logan, Centre chairman, and Mr T. W. Child, transformer sales manager

New Philips' Terms

IT was announced by Philips Electrical Ltd. on Tuesday that as from tomorrow (1 July) new terms will apply to all products marketed by their Lighting Division. The new terms are being circulated to all firms and undertakings on the Division's mailing list.

OFFICIAL PUBLICATIONS

MINES. Report of H.M. Inspectors of Mines for 1954. Northern Div. H.M.S.O. 2s.

NAT. COAL BOARD. Annual report and accounts for 1954 (see page 1096) H.M.S.O. 7s. 6d.

OVERSEAS ECONOMIC SURVEY. Pakistan H.M.S.O. 10s.

STATISTICAL DIGEST FOR 1954 compiled by Ministry of Fuel and Power (see page 1085) H.M.S.O. 25s.

MECHANICAL ENGINEERING RESEARCH 1954. Report of Board. H.M.S.O. 3s.

FOOD INVESTIGATION. Special Report 61 by D.S.I.R. Scientific and Technological Problems in using Ionising Radiations for Food Preservation, by R. S. Hannan. H.M.S.O. 7s 6d

A.1 AT LLOYDS

LLOYDS have a unique reputation in the shipping world for surveying and maritime insurance. How Lloyds developed from the original meeting place at Lloyd's coffee house where the original information on the condition of ships was collected and transmitted to the brokers, was wittily and briefly described by Mr R. J. Sladden who has now been with Lloyds for over 44 years. He told the Batti-Wallahs last Thursday of the difficulties of those early days in deriving accurate information, of the original differences between underwriters and ship owners, followed in the early 1800's by co-operation for mutual good.

The President referred to the recent motor accident in which Mr Mate (Mr T. C. Bigland) had been involved and gave the news that he was well on the way to recovery. In Mr Bigland's absence Mr J. Temple-Hazell took on Mr Mate's duties.

The next meeting of the Batti-Wallahs will be on Wednesday, July 27, and Mr John Brown, Chief Education Officer of the L.C.C., will be the principal speaker. There will be no August meeting.

Electricity Efficiency helps National Coal Board

SAVINGS amounting to 850,000 tons of coal during 1954 are attributed to increases in the efficiency of electricity generation. This is stated in the Annual Report for 1954 of the National Coal Board, which covers operations in a year during which British coal mines produced 214,000,000 tons of coal, 1·5 million more than in 1953. In view of the drastic reorganisation of the National Coal Board which has followed the Report of Dr Fleck and his colleagues, much of the information the Report contains on policy has now been overtaken by events.

Amongst notable technical developments during the year was the appointment of a director of the Board's Central Engineering Establishment, which is being set up at Bretby in Derbyshire to develop, in collaboration with manufacturers, various types of equipment used by the Board, and to test new equipment and materials. It is hoped that the building will be completed this year.

Technical investigations carried out by the Board during 1954 included the development of an electro - magnetic system for detecting faults in steel ropes. Tests, however, showed that complete reliability considered essential in this work was not achieved. There was also some consideration of the possibility of air conditioning mines as workings became deeper. (The temperature of the earth's crust increases with depth by about 1° F for every 60 ft.)

The N.C.B. had a deficit of £3·8m in 1954. Capital expenditure during the year £84·7m against £64·3m in 1953.

The First Half-Century

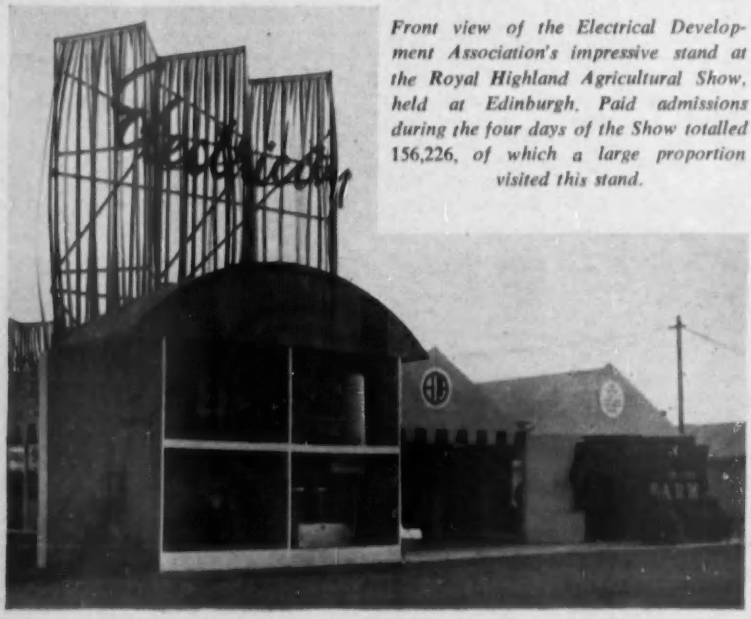
Mr Gilbert S. Ram, the electrical inspector to the Home Office, puts down a good deal of the shoddy work found in some motor installations to over - keen tendering under loose specifications. Under the stress of competition the tenderer cuts out as many superfluities as possible, and these superfluities are usually safeguards, such as switch and fuse covers. Frequently no specification is issued at all, with disastrous results should some jerry wireman with little capital and less reputation get the job by reason of his willingness to quote an impossibly low price. In their own interests factory owners and other power users should ensure that their installations contain no elements of danger, for an accident often costs several times as much as the wiring bill.—*From our Issue of 29th June, 1905.*

Jubilee Summer School

AS part of the celebration of their Golden Jubilee, N.A.L.G.O. are arranging an international summer school on British public services. It will take place at Oxford between 2 and 15 July, and will be attended by some 100 delegates from this country as well as 80 public servants from the Continent. We note that lectures to be given include one by Mr H. L. Clegg on public corporation and local authority procedure, with special reference to the development of electricity and gas services.

Golf in South-West

NEXT Tuesday (5 July) has been fixed for this year's south-west area golf meeting in the preliminary rounds of the E.I.B.A.'s National Golf Competition. The area meeting will take place at Yelverton Golf Club, S. Devon. Details may be obtained from Mr A. Hughes, B.I.C.C. Ltd., 7-9 Barton St, Bristol. The meeting will be followed by a dinner.



Front view of the Electrical Development Association's impressive stand at the Royal Highland Agricultural Show, held at Edinburgh. Paid admissions during the four days of the Show totalled 156,226, of which a large proportion visited this stand.

B.B.C. correspondent David Coleman interviews Mr R. E. Atkins, Norwich district manager of the Eastern Board outside the village school

200 Norfolk Consumers receive Electricity

RURAL electrification "switch-ons" appear to be a popular form of radio programme. Last Monday's programme featuring the S.W. Board's Exmoor scheme was preceded by one in B.B.C.'s Midland Region covering the Eastern Board's project at Swanton Abbot in Norfolk. This provided electricity to over 200 consumers in the parishes of Swanton Abbot and Skeyton and required the erection of 16 miles of high and low voltage mains with 29 transformers. The mains were carried on 192 poles for the high voltage sections, and with the aid of a pole hole borer, were erected by two men in 10 days. The 203 low-voltage poles had to be erected by hand. Of the total number of consumers to benefit, 154 received a supply without charge.

Invention Survey

SHORTAGE of staff is leading to increasing delays in the examination of applications for patents, the Comptroller-General of Patents states in his Annual Report for the year ended 1954. At the end of the year, there were 25,879 unexamined patents. Commenting on the trends of invention, the Comptroller mentions several electrical engineering developments. The electrolytic production of titanium has attracted attention, and there have been many developments in relaying and remote control. Transistors have been the subject of many inventions, while the recent conference on automation is recalled by the Comptroller's comments regarding machine tools. Here, development continued in all forms of copy machining, and the application of electronic control systems in this field received considerable attention. There was also much activity in the development of electric spark erosion methods, and in welding techniques.

A party of 14 of the N. of Scotland Hydro-Electric Board's lady demonstrators were entertained to lunch recently by Carron Co. Afterwards they were shown round the works and given a preview of the firm's "L" series electric cookers and the "Cameo" cooker before despatch to the Royal Highland Show and the B.E.P.C.

Parish Councils cannot afford Street Lighting Bills

PARISH Councils are finding it very difficult, if not impossible to maintain street lighting along Britain's main roads. The inability to bear the financial burden involved was referred to in the annual report of the Durham County Association of Parish Councils, especially as regards the stretch of the Great North Rd between Darlington and Gateshead. The road passes through the areas of 18 potential or operating lighting authorities, of which 13 were parish councils and one parish meeting. The report states that it is beyond the financial resources of these bodies, despite the Government grants towards maintenance and installation. An unlighted stretch of road between Chester-le-Street and Framwellgate Moor would not be dealt with because of the cost involved.

The County Association's report goes on to recall the comment of Mr E. C. Lennox some 25 years ago, that there were "alternating stretches of blackness and brilliance" along the Great North Rd. Mr Lennox is now the West sub-area manager of the N.E. Electricity Board. Some stretches of the road were potential death traps. At the last national conference of parish councils, a motion that the lighting of trunk roads should become the responsibility of the Ministry of Transport, was rejected.

NEWS IN BRIEF

The third Safety and Factory Efficiency Exhibition closes tomorrow (1 July), at 5.30 p.m. It is being held at Bingley Hall, Birmingham.

AC-Delco, are to open a third factory at Kirkby, Liverpool. Reason is to meet rising demand and their existing works are producing at full capacity.

A branch of the National Industrial Fuel Efficiency Service was formerly opened in Belfast by Sir Leslie Hollinghurst, last week.

An 18-page coloured, illustrated brochure "British Radio leads the World," is now being sent to prospective overseas visitors to the National Radio Show, which will take place at Earls Court, London, from 24 Aug. to 3 Sept.

Newcastle-on-Tyne transport officials are testing an electronic device which counts the number of passengers on the top deck of a bus. We understood also that the device will warn conductors of passengers who have not paid their fares.

As a result of the Eire Electricity Supply Bill, just issued, the Electricity Supply Board will be able to borrow up to £25m for rural electrification.

June issue of Technical Journal of The Brush Group, contains summaries of the principal articles in French and Spanish. The summaries, compiled for the first time, have been included in every copy sent overseas.

A three-day conference of depot managers of Marconi International Marine Communication Co., Ltd., held at Chelmsford, ends today.

Complete Sales Control

A NEW range of cash registers introduced by Rentrix Ltd. must attract the interest of all shopkeepers, especially those having more than one register at present. Primary advantage of the system made known for the first time last week is the remote and multiple control it embodies. With an instrument situated anywhere outside the actual shop premises, a flick of a switch will inform the manager of the exact value of sales made from any register or combination of registers. In addition the system can be arranged to provide other information too, such as the amount of credit and h.p. sales. Although cash is probably the obvious application, the same system can be used to record actual sales of individual items and similar information. Rentrix Ltd., 16 Grosvenor Place, London, S.W.1, have five main types of cash registration systems as well as a statistical system. Production is to start at once.

B.E.P.C. Exhibition

WE wish to make it clear that in our report of the above event last week, the reference, on pages 1027 and 1031, to the 1 kW convector heater manufactured by Gillott Electro-Appliances Ltd. should have described this heater as the "Chalford," and not as stated. The trade name used in our report has now been discontinued. We regret any inconvenience which may have been caused.

Were Contractors or Their Sub-contractors to Blame?

IN a case at Bow St (London) Court recently, the magistrate, Mr R. H. Blundell, had to decide whether the building contractors or their nominated electrical contractors were responsible for a fatal accident. George Wimpey and Co. were summoned for contravening the Factories Acts by failing to have the metal cap of a screw cap lamp covered with insulating material and protected, and so placed and safeguarded as to prevent damage. The summons was against Berkeley Electrical Engineering Co., Ltd., as actual offenders. The dead man was one of Wimpey's employees who was found on top of a lift in the building where the work was being done, clutching an electric lamp. He died on the way to hospital.

Mr M. Hoare, for Berkeleys, submitted there was no case for him to answer. The accident happened because someone took a lamp with a rubber ring out of the socket and someone else put one in without a ring. He said he was not employed to watch what happened to every lamp, and added that the holders had been used by Wimpeys before Berkeleys began work. Berkeleys, he said, had the installation contract and were responsible under that contract but there was nothing in it about maintenance. Mr J. May for Wimpeys, said his clients had shown every diligence and that their nominated contractors were to blame.

The magistrate decided that Berkeleys had committed no offence and the case against Wimpeys had been proved. He fined the latter £10 ordering them to pay £10. 10s. costs. They were also ordered to pay £10. 10s. costs to Berkeleys.

SPORTS DAY AT WEMBLEY

FOR the seventh successive year Head Office won the Leslie Gamage Cup for the leading London establishment at the 30th annual sports and gala of the General Electric Co., held at Preston Road in brilliant weather last Saturday. A new cup for the leading athlete at the sports was presented for the first time to Mr John Colville, of Head Office. Other attractions included a flower show, and Children's Corner which again held the interest of the younger generation. The prizes were presented by the Hon. Mrs Leslie Gamage, and dancing completed the evening.

QUESTIONS IN PARLIAMENT

Trading Disclosures

FEAR that reports of the Monopolies Commission might disclose facts which were of advantage to foreign competitors was expressed by Mr R. Harris on Thursday. He asked if the President of the Board of Trade was taking steps to ensure that this did not happen. Mr P. Thorneycroft said it was entirely within the Commission's discretion what information was included in their reports. Before a report was submitted to Parliament, he did consider whether grounds existed for omitting information under Section 9 of the Monopolies Act. Mr Thorneycroft added that he thought the fullest information should be laid before the public.

Level Tendering

THE general reference to the Monopolies Commission foreshadowed in the recent Commons debate, would cover common price arrangements and level tendering. Mr P. Thorneycroft stated. Asked by Mr D. W. Wade which items in the building industry would be investigated, he said it would be for the Commission to decide whether arrangements affecting the supply of any particular goods fell within their terms of reference.

Trade with the U.S.S.R.

FIGURES showing the quantity of U.K. exports of electrical equipment and machinery and of cables and wires to Russia, were published in *Hansard* last week in reply to a question by Mr H. Wilson. As regards electrical equipment, goods to the value of £872,463 were sent to the Soviet Union in 1952, dropping to £380,143 in 1953 and rising to £2,243,868 last year. In the first three months of this year £507,437 worth had been exported. Consignments of cables and wires amounted to 4,702 tons (£919,409) in 1953 and 853 tons (£146,375) in 1954. Jan. to Mar. exports totalled 296 tons (£58,249).

Peat-burning Power Stations

THE Secretary of State for Scotland was asked when the £500,000 was made available for the experimental peat-burning power station at Altnabreac, and how much had been spent. He said approval for the setting up of the experimental plants was given in July 1953. Expenditure during 1953-54 and 1954-55 amounted to about £129,000.

Diesel Fuel and Cancer

WHAT investigations were being made into the effect of fumes from diesel engines as a contributory factor in cancer of the lung? asked Sir Frank Medlicott last week. Mr J. R. Bevins informed him that the exhaust products of diesel engines under varying running conditions were being examined by the Medical Research Council. This matter was raised a short time ago at a meeting of the B.M.A. and Sir Frank enquired whether the increases in the use of diesel fuel and cancer were only a coincidence. Mr Bevins said that at the moment it was simply a coincidence, but added that diesel exhaust fumes were known to contain a great deal of soot, which ultimately induced cancer of the skin. (At the B.M.A. meeting the proposed replacement of London's trolley buses by diesel buses was criticised.)

Electronics Engineers

A SUGGESTION that the regulations should be altered so that all properly qualified electronic engineers were exempted from National Service was made by Mr Osborne. Replying, Sir Walter Monckton explained that persons holding university degrees in electronics or any other subject were not exempt. Indefinite deferment was granted to some science and engineering graduates for urgent work of high priority but only if the post could not be filled by someone not liable to service. Later he said he could not give the same prolonged deferment to men holding recognised diplomas from technical colleges as to those holding university diplomas, without considerable thought and inquiry. The number of deferments are rising rapidly and he did not want to give further concessions without thought.

Peaceful Uses of Nuclear Energy

ANOTHER assurance that the British Government was always willing to co-operate with other countries in promoting peaceful uses of nuclear energy, was given by the Prime Minister. He had been asked by Mr A. Henderson whether the U.K. would be associated with the programme recently officially announced by President Eisenhower to help other nations obtain nuclear research and power reactors. The Prime Minister reminded Mr. Henderson that Britain had taken a leading part in sponsoring the proposed International Atomic Energy Agency and had offered a contribution of 20 kilograms of fissile material. As regards the President's specific proposals in his speech at the Pennsylvania State University, Sir Anthony Eden said he would prefer not to comment until there had been more time to study them.

Exports to Canada

AN appeal to encourage increased exports to Canada, especially of engineering products, was made by Mr G. de Freitas. Mr P. Thorneycroft heartily agreed that exports to Canada should be stepped up as much as possible and explained that existing policies were designed to give the fullest assistance. The Board of Trade kept in close touch with exporters and provided a full service of commercial intelligence. In addition the Dollar Exports Council, in Britain and in Canada, continued to do everything possible to reinforce the Board's efforts.

A later question by Mr R. Stokes asked if the Government were suggesting to manufacturers that they should jump the queue with regard to deliveries. He pointed out that deliveries were becoming increasingly important because American deliveries were getting better. It was impossible to increase exports of capital goods to Canada unless manufacturers jumped the queue at this end. Mr Thorneycroft asserted that the question of priorities was a matter for industrialists themselves to decide.

Prices of Export Orders

LACK of confidence about the future stability of prices was suggested by Mr A. F. Holt as a reason for loss of export orders. Replying, Sir Edward Boyle said it was difficult to generalise about factors which determined who received an export order. While a number of orders were being lost on price grounds, figures showed that a lot of overseas business was being won against severe competition. Later Sir Edward pointed out that although price variations and escalator clauses might sometimes lose exports, the Germans had now begun to resort to clauses of a similar kind.

Exclusive Dealings Report

REPORT of the Monopolies Commission on exclusive dealing, collective boycotts and other discriminatory trade practices was to be published yesterday. Mr P. Thorneycroft gave this information in a written answer last week.

Flashing Indicators

RESULTS of the Road Research Laboratory's investigations into the use of flashing indicators on vehicles, were expected to be published in Oct., the Minister of Transport stated last week. He advised waiting for the report before making any decisions.

Car Headlamps

A MEETING of all parties concerned is to be called shortly by the Minister of Transport to work out practical steps which could be taken to reduce the danger caused by ill-adjusted head lamps on cars. Replying to Mr D. Jones, he said an international agreement on headlamp standardisation was bound to take time.

Underground Cables

A MOTION has been tabled in the Commons by Mr A. Blenkinsop concerning the laying of underground electricity cables in rural areas so as to preserve the beauties of the countryside. The motion expresses appreciation of the reported decision of the N.W. Electricity Board to arrange for the whole of its mains cable from Keswick to Rosthwaite in Borrowdale to be laid underground at considerable extra cost. It continues by expressing the hope that "this public spirited action will be regarded as a model for other areas of outstanding natural beauty."

ELECTRIC SUPPLY NEWS

Belfast

The Harbour Commissioners had earlier offered no objection to the erection of two 240 ft high concrete chimneys at the Corporation's Power Station West, provided the latter undertook to reduce the height to safeguard the flying approaches to the Harbour Airport. The city electrical engineer has pointed out that to reduce the height later would mean putting the station out of action for over six months, and the Commissioners have withdrawn the original proviso and replaced it by an alternative.

Bideford

The proposals of the South Western Electricity Board to erect overhead lines to supply the Bucks Mill and Speke's Valley areas have been objected to by the Planning Officer. But the Bideford Rural Council have decided to support the Board in this matter. At the recent meeting of the Council it was explained that the Board had stated in the case of Bucks Mills it would cost £2,000 more to use underground cables and for the Speke's Valley section a further £700 would be necessary. One member pointed out that three-quarters of the population of Bucks Mills had expressed their willingness to take a supply. They were all conscious of the amenities of the countryside but at the same time they were anxious to get electricity.

Blyth

The objections of seven local authorities in the North-East to the proposals of the C.E.A. to construct an aqueduct and pipeline to dispose of ash and water from the new Blyth power station, were ventilated last week when a Parliamentary Select Committee considered the Blyth Generating Station (Ancillary Powers) Bill. For the C.E.A. it was explained the new station would have four 120 MW sets, and it was expected that a second station would have four 200 MW machines. Ash disposal to the sea by pipeline, as proposed, would mean a saving of nearly £2m in capital expenditure and the operating costs would be £7,000 per annum compared with £70,000 by the alternative of dumping from barges. The latter method would entail the construction of a new barge dock. Replying to a question, Mr D. Clark, station development engineer to the C.E.A., said that the cost of extending the aqueduct farther out to sea would be prohibitive, and the Authority would not wish to extend the pipeline only, as it was necessary to maintain a mixture of ash slurry with the cooling water. Giving evidence about the probable results of the discharge of ash, Mr F. L. Harwood said large quantities of colliery refuse had been tipped on the shore over many years and, without exception the coastal drift carried it north. Heavy storms might affect the discharge of the ash for a short space of time, but the next tide would remove it. Earlier, Mr W. Menzies said it was known that fish swam for many miles off estuaries without being deterred by sand and silt, and he did not think salmon and sea trout would be deterred by the power station discharge. Prof A. D. Hobson, a director of the Marine Laboratory, Cullercoats, thought the effects of ash on marine life would be mechanical rather than chemical, and representatives of local fishermen also suggested their livelihood might be affected.

Sayings OF THE WEEK

"I should like somebody to define for me where the electrical engineer, who basically must always be, anyhow, a mechanical engineer, starts to become an electronic engineer and where the border line lies between electronic and chemical engineers and scientists . . ." SIR HARRY RAILING, at the B.E.P. conference.

"I take the view that if you cannot say what you have to say in twenty minutes you should go away and write a book about it . . ." LORD BRABAZON, in the House of Lords.

"Fish are thriving in Carmarthen Bay since the opening of the power station there, and never in living memory have catches been as good as they now are near the discharge point . . ." in a report to the South Wales Sea Fisheries District Committee.

Dartmoor

Dispute over the proposed erection of an overhead power line between Merrivale and Princetown by the South Western Electricity Board was the subject of a public inquiry at Tavistock. For the Board it was said that the new line was necessary to reinforce supplies to Princetown. The suggestion that the line should be underground was not as practicable as putting them overhead, because, for one reason, the Board had limited funds available for such purposes. For the Tavistock Rural Council, Mr L. J. Shepherd, chief sanitary inspector and surveyor, said the Council believed this present application would have a definite bearing on a later one to be made by the Board for a similar extension from Two Bridges to Postbridge and Bellever. His Council were neutral on whether the line was underground or o.h. They were anxious that the supply to Princetown be augmented as quickly as possible so they supported the Board's application because the erection of o.h. lines was far speedier. Opposing the application, Mrs S. Sayer, a member of the Dartmoor National Park Committee of Devon C.C., who also represented the Council for the Preservation of Rural England, and its Standing Committee on National Parks, the Ramblers' Association and the Dartmoor Preservation Society, said they wanted electricity to be brought to the Dartmoor homes, but in a manner which maintained the character and beauty of the National Park. That meant placing underground lengths of power line where they concerned areas of exceptional beauty or interest. She said the area in this case embraced a site of major archæological importance.

Lake District

The whole of a new power line from Keswick to Rosthwaite, including the circuit of Derwentwater, is to be underground, the North Western Electricity Board has now decided, although earlier, official planning permission had been given for sections of the line through Borrowdale to be overhead. Mr J. E. Shepherd, manager of the Board's No. 6 sub-area, has said that it had been decided to place underground the three lengths which the Lake District Planning Board earlier agreed could be overhead, for technical reasons and also because the Electricity Board wanted to meet all shades of public opinion so far as such a beautiful part of the Lake District was concerned. He stressed that neither the Electricity Board nor the Planning Board should be assumed to have established a precedent in this case, and that each individual electricity scheme in the Lake District would have to stand on its own merits. It was hoped to have the new power line in operation by next Apr.

Staythorpe

The Minister of Fuel and Power has approved the proposals of the C.E.A. for the new Scunthorpe "B" power station, including the erection of three natural draught cooling towers. It will be recalled that at a public inquiry last Mar., the Southwell and Newark Rural Councils suggested that mechanical draught cooling towers should be erected. The Minister has informed the Newark Rural Council that he felt that the conditions at the station were such that he had deemed the suggestion impracticable. This new Staythorpe "B" power station is planned to have an ultimate capacity of 360 MW.

Stella North

The first of four Parsons 60 MW turbo-alternators at this new power station was put into commission on Friday last.

LIGHTING SCHEMES

Hastings. The T.C. is considering a £8,000 scheme for improving street lighting. It involves the change-over of 2,200 lamps from reflector to refractor type.

Leicester. At the end of 1954 there were 3,772 gas lamps in the city. Mr T. Wilkie, the lighting engineer, reports that further conversion work will start before next winter.

Plymouth. T.C. has received consent to borrow £7,910 for improved street lighting in the city centre. Part will be by fluorescent lighting and part by 400 W h.p.m.v. lighting.

COMPANY ACTIVITIES

Another brilliant year has been achieved by Thorn Electrical Industries under the able chairmanship of Mr Jules Thorn. Group profits are £447,000 higher at £1,502,000. The company's products include Atlas lamps, Ferguson radio and TV sets, in addition to Tricity Cookers. The group also claims to be the largest manufacturer of fluorescent lighting appliances.

The dividend of 15% is on a capital doubled by a scrip bonus. It means an effective increase of 5%. As well as a 100% share bonus, there is also to be a "rights" issue raising £1,870,000. The new issue takes the form of a "rights" offer of 2,137,500 "A" Ordinary shares of 5s. each in the proportion of one new "A" Ordinary for every two Ordinary held on 23 June. Price will be 17s. 6d. per share, which represents a substantial bonus, as the Ordinary shares are 30s. The "A" shares will not rank for dividend for the year ended 31 Mar. last, and will carry no voting rights. The outlook for the company is rosy, and there seems to be no reason why profits should not go higher.

As I anticipated Morgan Crucible Company reports a record year's production and sales, for the period to 31 Mar. last. According to Mr P. Lindsay, the chairman, sales proceeds were 15% higher and as there were no price changes, this, "provides a measure of the increase in the volume of business." The ratio of foreign to total trade fell slightly from 44% to 43%. There was also a new peak in trading profits at £2,319,000 against £823,000. The previous record was in 1951/52 when the group figure was around £2,100,000. Prices were kept unchanged by mechanisation and improved organisation which only shows what can be done when managements really try to offset the costs spiral.

Mr. M. A. T. Johnson, chairman of Richard Johnson and Nephew, the wire manufacturers, joins the growing list of manufacturers who are protesting against the instability in the price of copper. He believes that the present high price will lead to substitution, and that once substitution is made, such outlets are likely to be lost for good. In certain instances really big economies can be effected by substituting aluminium for copper. Mr Johnson also has a go at the Rhodesian Selection Trust Group's price fixing arrangements. Their copper output he says, is available in a form which only a few manufacturers are able to use. It is of no benefit to R. J. and N.

Driving all round the wicket, Mr Johnson also says in his annual statement that the Board of Trade had not helped toward achieving stability "by disposing of some of its stocks to the highest bidder over and above the London Metal Exchange price."—*From our City Correspondent.*

Aiton and Co. Ltd.

For the year to 31 Mar. last, the trading profit is £378,704 (*£410,448*).

Belliss and Morcom Ltd.

The group net profit for the year ended 31 Mar. last is £152,280 (*£61,170*). A final dividend of 8½% again makes the total 11%, plus 5% not taxable from capital profits (*nil*).

Electric Construction Co. Ltd.

The net profit for the year to 31 Mar. last is £123,203 (*£110,526*), and the dividend is 8½% on capital doubled by a scrip issue. 15% was paid for the previous year on the old capital.

Engineering and Lighting Equipment Co. Ltd.

Turnover for the past year was a record for the company although during the latter part there was a reduction in demand for the specialised electrical and mechanical apparatus for the shipbuilding industry, the Earl of Verulam, the chairman, states. But the range of production is being extended to certain new fields, and the selling policy changed so that throughout the British Isles sales will be made direct by the firm's own technical representatives and sales engineers. The new departments for sand and gravity die-casting in aluminium and its alloys are expected to be completed shortly.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	89,847	30,302	53	5	3/-	1/3
1952	102,066	33,616	59	10	2/4	1/6
1953	138,330	41,285	71	15	3/1	1/10
1954	238,163	84,912	150	30	14/6	3/-
1955	281,387	129,272	89	30*	6/2	5/-

*Plus 150% capital bonus.

Hackbridge and Hewittic Electric Co. Ltd.

Group consolidated trading profit for the year ended 31 Mar. last is £524,931, compared with £504,303 for the previous year. The net profit amounts to £213,284 (*£167,767*). There is a final dividend of 22½%, making 30% (*25%*) for the year. It is proposed to capitalise £200,000 of reserves by issuing to Ordinary holders 800,000 5s. Ordinary shares in the proportion of two-for-five, and to issue by way of rights 200,000 Ordinary 5s. shares at 12s. 6d. each on a 1-for-12 basis.

International Combustion Africa

Trading profit for the twelve months ended 30 Sept. last is £323,849 (*£173,943*) after charging depreciation, etc.

Marryat and Scott Holdings Ltd.

For the year to 31 Mar. last the group net profit is £148,313 (*£126,027*) before charging taxation. The dividend is raised by 5% to 30%.

Radio Rentals Ltd.

Treasury consent has been received to the issue of 300,000 5s. Ordinary shares for cash.

E. Shipton and Co. (Holdings) Ltd.

The net consolidated profit for the year to 31 Mar. last, before taxation, is £42,463. A final dividend of 12½% makes the total 22½%.

Siemens Brothers and Co. Ltd.

After allowing all charges, including taxation, the net profit for 1954 is £228,844, compared with £488,357 for the previous year. A 10% dividend was paid in April, the same as for 1953.

Thorn Electrical Industries Ltd.

A substantial increase in the group trading profit for the year ended 31 Mar. last, is reported by this concern. The figure is £1,501,612, which compares with £1,054,348 for the previous year. After deducting all charges, including depreciation, and increased taxation, the net profit amounts to £609,007 (*£315,566*). There is a dividend of 15% on the doubled capital, against 20% last time.

John Thomson Ltd.

Output was a record last year amounting to over £17m in value, and while with large contracts the order book does tend to fluctuate, the amount of orders on hand is approximately £38m, Mr Edward W. Thompson, the chairman states. Output for the home companies so far this year shows a substantial increase over the corresponding figure for 1954, he adds. A South African concern has been acquired whose works it is hoped will be in full production towards the end of this year. The Canadian associated company, while making a loss last year, is now fully employed and should prove profitable.

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	1,165,162	403,680	108	22½	20/4	14/1
1951	1,203,383	393,880	105	22½	27/-	19/4
1952	1,320,385	381,158	78	22½	22/4	15/6
1953	1,447,518	413,168	85	22½	23/4	18/3
1954	2,023,769	777,586	72	25*	29/10	20/7

*Plus 60% capital bonus.

Walsall Conduits Ltd.

The group trading profit for 1954 is £449,344, as against £405,561 for the previous year, the net profit figures being £215,241 (*£146,131*) respectively. A final dividend of 50% again makes the total 70%. There is to be a three-for-one scrip issue, the directors announce.

Dividends Declared

International Combustion Africa. Interim 15% (*same*).

Marco Refrigerators Ltd. Interim 2½% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

1 July—Kirkcaldy T.C. Installation at Old Folks' Home in Dunnikier Rd.—See 9 June issue.

1 July—Macclesfield T.C. Sodium lighting on concrete columns along Hurdsfield Rd, Cumberland and King Edward Sts.—Advertised in 9 June issue.

1 July—Maidstone T.C. Installation in 88 houses on Shepway estate. Borough Surveyor, Palace Ave.—See 23 June issue.

1 July—Norwich T.C. Rewiring of Bridewell Museum.—See 23 June issue.

2 July—Bradford T.C. Lighting, heating at Conditioning Hse.—See 16 June issue.

2 July—Stockport T.C. Classroom lighting at Greek St high school for girls.—See 23 June issue.

4 July—Manchester T.C. Heating installation at Crumpsall open air school.—Advertised in 23 June issue.

4 July—Manchester T.C. Installation in 150 flats in Floats Hall, Greenbrow and Colshaw Rds, at Wythenshaw.—Advertised in 23 June issue.

4 July—Stranraer T.C. Electrical fittings in old people's houses and clubs.—See 23 June issue.

5 July—Co. Antrim. Installation in intermediate school in Warren Gardens, Lisburn.—See 23 June issue.

5 July—Bedlington (Northumb) U.D.C. Vertical spindle unchokeable centrifugal pumps, driven by electric motors.—See 2 June issue.

5 July—Swansea T.C. Lighting installation at central garage and workshops at Pipe Hse Wharf.—See 16 June issue.

6 July—Bingley U.D.C. Concrete columns, lanterns, auxiliary gear, etc., for street lighting in Cottingley Moor Rd.—See 9 June issue.

6 July—Birmingham T.C. Installation at aged persons' home in Alvechurch Rd, West Heath.—See 23 June issue.

6 July—Clutton (Bristol) R.D.C. Installation in 20 houses at High Littleton.—See 23 June issue.

6 July—Coleraine (N.I.). Installation, including stage lighting in new parochial Hall, Kilrea.—See 23 June issue.

6 July—Derby T.C. Installation in 84 houses and bungalows in Harvey Rd.—See 16 June issue.

7 July—Cornwall. Electrical installation in junior and infants' school at St. Eval. Apply by above date to S. Gregson, County Architect, County Hall, Truro.

7 July—Co. Down. Installation in Downpatrick technical and intermediate school.—See 23 June issue.

7 July—Galway. Installation in nurses' home at Monaghan mental hospital.—See 23 June issue.

7 July—Liverpool. Supply of electric lamps for N. Liverpool Hospital Committee. Supplies Officer, Walton Hospital, Rice Lane.

7 July—Manchester T.C. Supply of electric lamps. City Surveyor, Town Hall.

8 July—Bridlington T.C. Supply and erection of electrically operated and controlled small sets of duplicate pumping plant at Wold Newton. Water Engineer, 11 Merton Rd. Deposit £2. 2s.

8 July—Herefordshire. Electrical goods for Welfare Depot.—See 23 June issue.

8 July—Llanelly T.C. Installation of about 300 Class A lighting units comprising 140 W sodium discharge lamps, switchgear on new columns in town centre. Borough Engineer, Town Hall. Deposit £2. 2s.

8 July—Westmeath (Eire). Two electrically operated low lift pumping units for Kinnegad sewerage scheme.—See 16 June issue.

9 July—Co. Louth. Pumping and water filtration plant in supply system for villages of Louth, Mullacrew and Tallanstown.—See 12 May issue.

11 July—Co. Dublin. Electrically driven booster unit at Swords.—See 23 June issue.

11 July—Hebburn U.D.C. Installation in 120 houses in Monkton Lane.—See 23 June issue.

11 July—Keighley T.C. Installation in Eastwood secondary modern school.—See 23 June issue.

11 July—Kingston-on-Hull T.C. Light and power installation at Thanet county primary school. A. Rankine, City Architect. Deposit £1. 1s.

11 July—Manchester T.C. Installation at King St Central Highway Depot, Ardwick.—Advertised in 16 June issue.

11 July—Stepney B.C. Installation in 30 dwellings and electric lift for Lance St housing scheme.—Advertised in 23 June issue.

12 July—Aireborough U.D.C. Class B mercury vapour lighting in Over Lane, Town St, and Layton Rd, Rawdon.—Advertised in 23 June issue.

13 July—Bath T.C. Electrical installation in 14 dwellings on Moorlands estate. City Planning Officer and Architect, 7 North Parade Buildings. Deposit £1. 1s.

13 July—Newcastle-on-Tyne T.C. Installation in 852 flats on Longbenton estate.—See 16 June issue.

13 July—Sutton and Cheam T.C. Erection only of concrete columns and supply and fixing of G.E.C. lanterns and all auxiliary equipment for 140 W sodium lighting scheme on about 1·65 miles of roads. N. H. Michell, Borough Engineer, Municipal Offices, High St, Sutton. Deposit £1. 1s.

14 July—Blackburn T.C. Conversion of side street lighting from gas to electricity.—Advertised in 23 June issue.

14 July—Cardiff R.D.C. Electrical installation in 15 houses at Tongwynlais. S. P. Youldon, Engineer and Surveyor, Council Offices, 20 Park Place.

15 July—Hawick T.C. Electrical installation in seven blocks (20 houses) on Burnhead site. John A. W. Grant, C.A., 36 Melville St, Edinburgh.

15 July—Wigan T.C. Electrical installation in 8 shops, 2 kiosks and adjacent arcades in new Market Hall extension. Borough Engineer, Municipal Buildings, Hewlett St. Deposit £1. 1s.

18 July—Halstead U.D.C. Supply, erection, two sewage pumping units (contract No. 3) each comprising automatically controlled, electrically operated vertical spindle centrifugal pumping set. A. P. I. Cotterell and Sons, 54 Victoria St, Westminster, S.W.1. Deposit £2. 2s.

18 July—Stocksbridge U.D.C. Supply, erection of 100 140 W sodium vapour discharge lamps on concrete columns and ancillary equipment for street lighting along trunk road A.616. D. E. Robinson, Surveyor, Town Hall.

20 July—Newcastle-on-Tyne T.C. Installation in 1,015 houses on St. Anthony's estate.—See 16 June issue.

21 July—Boston T.C. Supply, installation and maintenance of 13 electrically operated and one diesel operated vertical spindle centrifugal pumps, and ancillary equipment for West Side sewerage scheme. Borough Engineer and Surveyor, Municipal Buildings. Deposit £3. 3s.

23 July—Hastings T.C. Electrical installation in extension to secondary modern school, Red Lake. Borough Engineer, 37 Wellington Sq. Deposit £2. 2s.

25 July—Manchester T.C. Electrical installation at Kirkmanshulme grammar school. City Architect, P.O. Box 488, Town Hall.

4 Aug.—Coppull (Lancs) P.C. Supply and erection of 35 sodium discharge street lighting units for trunk road A.49. W. Groves, Engineer and Surveyor, Council Offices, Gillibrand St, Chorley.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 116 queries answered this week

"Nelson" blankets, makers of? N.W.B.—Electro Medical Blankets Ltd., Nugent St, Leicester.

"Shernal" shaver, makers of? T.B.—Arvin Electric Ltd., Fernbrook Ave, Southend-on-Sea.

"Quickmix" mixer, makers of? A.C.S.—Precision Plastics Ltd., 248 Bordesley Green Rd, Birmingham 9.

Senior Lighting makers of the "Senior" hairdryer, address for? S.E.B.—The former products of this concern were taken over by the Tide Electrical Co., Ltd., 34/36 High St, Southall, Middx.

Rubber-covered double push button hoist control switch, makers of? R.W.—Asea Electric Ltd., Fulbourne Rd, E.17.

CORRECTIONS

"Secundalux" emergency lighting, makers of? W.C.—G. B.-Kalee Ltd., Mortimer Hse, 37/41 Mortimer St, London, W.1, are handling all enquiries for this system. The address at Wendover is no longer operative.

Infra-red grillers, makers of? T.E.—The Brattel Electric Co., Ltd., address was given as Dorchester-on-Thames last week under this heading, the address is now: 142 Southampton Row, W.C.1.

11 Aug.—Belfast T.C. Supply, erection at Power Station West of passenger/goods lift of 2,000 lb capacity. Tender N.1723. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

No date stated.—N. of Scotland H.E. Board. 132 kV double circuit steel tower transmission line between Nairn and Keith.—Advertised in 23 June issue.

No date stated—N. of Scotland H.E. Board. Installation at Kilmelfort power station.—Advertised in 23 June issue.

No date stated—N. of Scotland H. E. Board. Supply and erection of 22 kV and l.v. distribution lines on islands of N. Uist, Berneray, Barra and Vatersay. Merz and McLellan, 72a George St, Edinburgh. Deposit £2. 2s.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

20 July—New Zealand. Supply of total of 1,300 potentiometers and 450 resistors to various specifications for Director-General (Stores Div.), G.P.O., Wellington. Tender No. P. and T. 150/8007. B.o.T. (Ref.: ESB 12890/55).*

20 July — Uruguay. Administracion General de las Usinas Electricas y los Telefonos del Estado, require supply of some 170 transformers and spares to various specifications. Tender No. 4167/55. B.o.T. (Ref.: ESB 13145/55).*

26 July—Uruguay. Supply of various cables and accessories required by Administracion Nacional de Combustibles Alcohol y Portland. Specif. No. 2658. B.o.T. (Ref.: ESB 12939/55).*

29 July—Australia. Supply of 10,000 yd of 11 kV underground cable and 33 kV cable terminations. Contract E.11/55. Brisbane City Council's Dept. of Electricity, City Hall, Brisbane. B.o.T. (Ref.: ESB 12498/55).*

29 July—South Africa. Stores Dept. of S. African Railways, Johannesburg, invite tenders (No. C.5087) for electrical signalling material (relays). B.o.T. (Ref.: ESB 13019/55).*

29 July—South Africa. Tenders (No. C.9222) invited for supply of traction substation equipment, including switchgear, transformers, circuit-breakers, rectifiers, generator sets, etc. Stores Dept., S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 12077/55).*

2 Aug.—Korea. Supply of mercury arc rectifiers with transformers, feeders, controls and switchgear, etc., under F.O.A. Procurement. Authorisation No. 88-720-99-76-5285. Office of Supply, Govt. of Korea, Seoul, Korea. B.o.T. (Ref.: ESB 13133/55).*

5 Aug.—Australia. Tenders (specif. No. E.12/55) invited for supply of switchgear and fuses by Brisbane City Council, City Hall. B.o.T. (Ref.: ESB 12950/55).*

Contracts Placed

Birmingham T.C. Installation at Elms Farm junior school, E. J. Wilcock Ltd.; Lighting and power at Wychall Farm school, Midlands Electricity Board.

Bournemouth T.C. Replacement of lifts at Pavilion, Porn and Dunwoody Ltd., £1,760.

Carlisle T.C. Installation in 54 houses on Harraby estate, Hartley Electromotives Ltd.

Maidenhead T.C. Improvement of street lighting along main and district roads, Harland and Wolff Ltd., £6,400.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 28 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	340	−10	239
„ (3 months)	331½	−6½	237
R.S.T. (Rhodesian Selection Trust) group price*	280	—	—
LEAD, refined pig, min. 99·97% purity (cash)	103	−½	98
„ (3 months)	102½	−½	95½
TIN, refined, min. 99·75% purity (settlement)	726½	+½	750
„ (3 months)	726½	+½	746
ALUMINIUM, ingots 99·99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	91½	−½	78½
„ (3 months)	90½	−½	79½
RUBBER No. 1, RSS. spot (per lb.)	37½d.	+1½d.	20½d.
„ c.i.f. basis, ports, Aug. (per lb.)	32½d.	+1d.	20d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	54	—	52
Mild Steel Tape (0·014 in.)	41½	—	40½

(*Fixed price c.i.f., U.K. originally operative for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price." Pending new notification, price subject to change at 24 hr. notice.)

11 Aug.—Brazil. Comissao Estadual de Energia Eletrica inviting tenders for supply of necessary equipment for transformer substation, joining two hydro-electric grid systems, at Cruzeiro. B.o.T. (Ref.: ESB 11881/55).*

30 Aug.—New Zealand. Manufacture, supply, etc., of 400 V switchgear of single busbar indoor metal-clad type for Atiamuri power station. Contract No. 276. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 12828/55).*

11 Oct.—New Zealand. Manufacture supply, etc., of eight single-phase auto-transformer units, each 6,667 kVA, 63·5/38·1/11 kV, 50 cycles, outdoor type, oil immersed and preferably naturally cooled. They are for Kikiwa and Stoke substations. Contract No. 278. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 13007/55).*

26 Oct.—Australia. Manufacture, supply, etc., of two water tube boilers, pipe work, ash handling plant, etc., under specif. No. 55-56/6 for Yallourn E. power station. Documents available from Agent-General for Victoria, Victoria Hse, Melbourne Place, Strand, London, W.C.2.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Chorehorse. 740,689. Class 7. Petrol engines and electric generators. Threestokes Ltd., also trading as Stokes, Stokes and Stokes, 51a Victoria Park Rd, E.9.

Powers-Samas. 728,202. Class 9. Apparatus, instruments, etc. Powers-Samas Accounting Machines Ltd., Powers-Samas House, Holborn Bars, E.C.1.

Solarscope. 735,237. Class 9. Electronic and electrical apparatus and instruments. Solartron Electronic Group Ltd., Solartron Works, Queens Rd, Thames Ditton, Surrey.

Sonograph. 731,541. Class 9. Electrical and magnetic sound recording and reproducing apparatus. Hartley Electromotives Ltd., 37 Thurloe St, South Kensington, S.W.7.

Twinco. 739,303. Class 9. Specification includes coil and valve holders, junction boxes, condensers, etc. Twinco Ltd., Leominster Works, Lower Essex St, Birmingham 5.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Tolcap Ltd., 40 College Rd, Harrow, Middlesex. Exporters, importers, manufacturers of and dealers in television, wireless and electrical components, etc. Nom. cap.: £100. Dir.: Eva Crowe.

Argyle Domestic Ware Ltd., Argyle Hse, 29/31 Euston Rd, N.W.1. Nom. cap.: £100. Manufacturers of and dealers in domestic, household and general electrical and other equipment, etc. Dir.: R. A. Hill.

Levers (Electrical) Ltd., 4a Prescot St, Liverpool, 1. Wireless, television, telephonic and telegraphic engineers, etc. Nom. cap.: £1,000. Dirs.: S. Lever and Therese Lever.

H. J. P. Bayliss and Son Ltd., 312 Long Lane, Finchley, N.2. Mechanical, electrical and electronic engineers, etc. Nom. cap.: £100. Dirs.: H. J. P. Bayliss and P. J. Bayliss.

C. A. E. (Chingford) Ltd. Electricians, mechanical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Sub.: W. J. Pretty and Mrs A. Pretty.

Burke Electrical Services (London) Ltd. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: C. C. Windsor, 27 Warren Drive, Tolworth, Surbiton, Surrey; and D. N. Levinson, 23 Harcourt Hse, 10 Cavendish Sq, W.1.

Lawton and Carter Ltd., 413 Turnhurst Rd, Packmoor, Stoke-on-Trent. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: W. S. Lawton; and R. Carter.

Technical Overseas Services Ltd. Electric, wireless, telephone, lighting, heating, motor, mechanical and general engineers, etc. Nom. cap.: £100. Dir.: G. H. Wood, 7 Queen Anne's Gdns, Ealing, W.8: and others to be appointed by sub. Sub.: L. F. Wescott, 159 Valley Dr, Kingsbury, N.W.9.

Ongar Engineering Co., Ltd., High St, Ongar, Essex. Manufacturers of and dealers in domestic, household and general electrical and other equipment, etc. Nom. cap.: £1,000. Dirs.: R. J. White, G. W. White, B. W. G. Brighty, R. Wood and R. G. Cousins.

Magneto Winding Co., Ltd., Creek Hse, High St, Kingston-on-Thames. Electronic coil winders and rewinding specialists, etc. Nom. cap.: £1,000. Permt. Dirs.: P. O'Boyle and S. G. Mortimer.

BUSINESS PROSPECTS

Home

Airdrie T.C. Scheme approved for erection of 24 houses and 16 flats on Burnfoot site (second section).

Aylesbury T.C. Eighty houses to be built at Meadowcroft by H. C. Janes Ltd., 189 High Town Rd, Luton.

Ayr. Wylie, Shanks and Wylie, 12 Clairmont Gardens, Glasgow, are architects for alterations at 81 High St. for Clydesdale and N. of Scotland Bank Ltd. Estimated cost £21,000.

Belfast. S. Stevenson and Sons, 83 Royal Ave, have been appointed architects for erection of 50,000 sq ft advance factory on Castlereagh factory estate.

Bournemouth T.C. Revised plans approved for reconstruction of Grand Hall and lounge at Town Hall. Estimated cost £270,000. Also, Royal London Mutual Insurance Soc. have acquired Metropole Hotel site for erection of 7-storey shop and office building.

Brighton T.C. Construction of total of 118 houses on North Woodingdean estate. Borough Engineer and Surveyor, 26-30 King's Rd.

Bristol T.C. It is proposed to erect 11-storey block of 108 flats behind Frogmore St.

Cardiff. Scheme for block of shops in Wood St. area for Hugh Jones, Cava and Lougher, 20 Churchill Way, is in early stages. Architects are Powell and Alport, 88 Cathedral Rd. Plans approved for secondary modern girls' school in Bishopstown Rd costing about £148,000. Plans being prepared also for Fairwater county secondary mixed school.

Crosby (Lancs) T.C. Application to be made to borrow £143,300 for erection of houses on Thornton estate.

Derby. Provision of several new departments planned at Royal Infirmary by Sheffield Hospital Board.

Doncaster. Approval granted for erection of secondary modern school on Jossey Lane estate, Bentley, at estimated cost of £160,000.

Durham. Construction of 136 houses in Dene Hse Development, for Peterlee Development Corpn. A. V. Williams, general manager, Shotton Hall, Castle Eden.

Ennerdale (Cumb) R.D.C. It is proposed to erect 10 houses each at Arlecdon and Moresby Parks.

Farnham (Sur). Work on new £96,000 divisional police headquarters to start next year.

Glasgow T.C. Erection of 230 and 201 houses at Castlemilk. Architectural and Planning Dept., 20 Trongate.

Also, two-storey office block at 349 Dobbies Loan to be built for Federated Paints Ltd., 2 Newton Place. F. Burnet and Boston, 180 Hope St, are architects.

Greenwich B.C. Erection of 33 flats on sites in Ormiston and Halstow Rds. Borough Engineer and Surveyor, Town Hall.

Halesowen T.C. Plans for Basonage Farm estate will probably be prepared by A. T. Butler and Partners, architects, 31 Priory St, Dudley. Also, J. C. T. Cole, Central Buildings, Long Lane, Blackheath, Birmingham, may be architects for flats at Highfield.

Hebburn-on-Tyne U.D.C. Approval received for expenditure of £153,609 on erection of 120 houses on Monkton Lane estate.

Isle of Ely. Tenders may be reinvited for erection of Queen's boys' school at Wisbech.

Lambeth. Development of Mumford Rd sites has been approved. It comprises blocks of 6 flats, 44 maisonnettes and 21 houses, besides other buildings. Cost estimated at £173,380.

Lewisham. Lewisham Rd—Morden Hill site to be redeveloped for housing at cost of about £114,000.

Manchester. Plans being prepared for 10-storey office and warehouse block in Quay St for Samuel Gratrix Ltd. Leach, Rhodes and Walker, architects, Diocesan Chambers, 90 Deansgate.

Middlesbrough T.C. Contracts to be let soon for erection of 63 houses and 10 police houses on Pallister Park estate.

Morley (Yorks) T.C. Revised Layout prepared for 486 houses on Low Moor estate.

Newport (I.o.W.) T.C. Council houses to be provided with electricity to be inspected prior to invitation of tenders.

Orpington U.D.C. Erection of single-storey office building, comprising seven blocks in High St. Engineer and Surveyor, 46 Barkhart Rd.

Scunthorpe. Public inquiry to be held into T.C.'s application to borrow £250,000 for construction of civic centre at Ashby.

South Shields T.C. Cairns and Byles of Newcastle have been appointed consultants for electrical and heating installations at proposed Mortimer county secondary school.

Southport. Tenders may soon be invited for conversion of Hesketh Park Hydro into convalescent hospital for Liverpool Hospital Board.

Walthamstow T.C. Sketch plans approved for erection of Folly Lane secondary school. Cost estimated at £120,470.

Overseas

Venezuela. Mr George Valant, Apartado 3075, Caracas, wishes to contact U.K. manufacturers of small electric water heaters, a domestic electric mill for grinding maize with motor, and electric food mixers with accessories. He has enquiries from potential buyers.

Trade Notes

New Depot. Siemens Electric Lamps and Supplies Ltd. have opened a new sub-branch at 42 Brooks Hall Rd, Ipswich. Telephone 51226. Mr L. A. Marks is the sub-area manager.

Change of Address. John Thompson Industrial Constructions Ltd. are now at 2 Princes Row, Buckingham Palace Rd, S.W.1. Telephone Victoria 9312.

'Phone No. All the telephone lines of British Central Electrical Co. Ltd. are now operating on Terminus 0111.

Acquisition. Thorn Electrical Industries Ltd. have purchased the Ordinary share capital of H. Herrmann Ltd., radio and television cabinets and furniture manufacturers.

MEETINGS TO NOTE

MONDAY, 4 JULY

A.S.E.E. (Sheffield). Annual meeting at Royal Victoria Hotel, 7.30 p.m.

TUESDAY, 5 JULY

E.I.B.A. Annual meeting at I.E.E. building in Savoy Place, London, W.C.2, at 11 a.m.

Gazette Announcements

COMPANIES ACTS

Philipp Clement Ltd. F. Goodman, 3 Broad St, Buildings, Liverpool St, London, E.C.2, the liquidator, released as from 31 Mar.

Dudley Electrical (Wholesale) Supplies Ltd. Last day for receiving proofs in respect of intended dividends, 6 July. Liquidator is R. K. Clark, Official Receiver, Somerset Hse, 37 Temple St, Birmingham.

C. Saunders and Co. (Electrical Contractors) Ltd. Petition for winding-up presented on 16 June and is directed to be heard before County Court at the Guildhall, Lincoln, on 19 July. Interested parties should contact Langley, Phillips and Coleman, 34 Silver St, Lincoln, agents for petitioners' solicitors.

County Electronics Ltd. Meetings of members and creditors to be held at offices of Harry L. Price and Co., 47 Mosley St, Manchester, on 29 July at 3 p.m. and 3.15 p.m. to receive liquidator's report.

Guardalarms Ltd. Meeting of members will take place at Avocet Hse, 92-96 Vauxhall Bridge Rd, S.W.1, on 21 July at 11 a.m. to receive liquidator's report.

Marlow and Wildman Ltd. L. C. Curtis of 13 Wimpole St, London, W.1, has been appointed liquidator with committee of inspection.

H. V. Colman and Co. (Electrical Contractors) Ltd. Winding-up order dated 20 June. Petition presented on 21 Apr.

J. and R. Morgan (Brighton) Ltd. Resolution for voluntary winding-up passed at meeting on 21 June, when W. A. Sutherland, of Hilton, Sharp and Clarke, 13 Ship St, Brighton, was appointed liquidator.

BANKRUPTCY ACTS

Intended Dividends

Ashton-under-Lyne. Ewart B. Page, electrical engineer trading at 10 and 12 John St, Hyde. Last day for receiving proofs, 5 July. Trustee is W. H. Haigh, Official Receiver, 20 Byrom St, Manchester.

Liverpool. William R. Eagle, electrical contractor trading at 10 Houghton Chambers, 1 Houghton Place, Liverpool. 5 July is last day for receiving proofs. Trustee is E. S. Browne, C.A., Central Buildings, 41 North John St, Liverpool.

Liverpool. Herbert Pryor, electronic engineer, trading as W. Pryor at 36 Low Hill. Last day for receiving proofs, 8 July. Trustee is S. O. Henry, regd. acc., 5 Rumford Place, Liverpool.

Dividends

Bolton. Herbert S. Page, electrical retailer trading at 109 Market St, Westhoughton. First dividends of 1s. 6d. in £ payable on 4 July at offices of Trustee, 47 Mosley St, Manchester.

Leeds. Donald Cunningham and Arthur E. Beacock, trading as The Home Electrical Maintenance Co. at 39-40 Trevelyan Chambers, Boar Lane, Leeds. First and final dividends of 20s. in £ with 4% statutory interest, payable on 14 July at Official Receiver's Office, 29 East Parade, Leeds 1.

TELEPHONE RENTALS LIMITED

A SUCCESSFUL TRADING YEAR

Mr. Fred T. Jackson on Progress of Overseas Activities

THE twenty-sixth annual general meeting of Telephone Rentals Ltd. was held on 27 June at the Caxton Hall, Westminster, London, S.W.1, Mr Fred T. Jackson, O.B.E., COMP.I.E.E. (Chairman and Joint Managing Director), presiding.

The following is an extract from his circulated statement:

At the risk of being monotonous I am once more able to report that we have had a successful year's trading during 1954. Our Profits have again grown and as a Board we feel every justification for increasing our Dividend to 12½%.

You may remember at our last year's meeting I paid a tribute to the whole of our Staff and the effectiveness of our Profit Sharing Scheme, and I feel it is only right to emphasise that much of our progress is due to the employees, whatever their positions in the Company. They are definitely entitled to share in the Company's increased prosperity.

Company's Activities

I will now deal with the progress made during the year in the Company's activities. The biggest part of our profits naturally arise in the Home Market, but I will endeavour to survey briefly the whole of our activities which now extend to a considerable part of the British Commonwealth.

British Isles: During the year we certainly met with the increased competition which I forecast in my speech last year, but we do not fear competition, for it can always be overcome by good management and increased efficiency on the part of our salesmen. The net additional Annual Rental secured under Contracts was slightly in excess of our target, and it is a very comforting thought that the more our services are employed and their value becomes appreciated, the more our business expands, and this coupled with the fact that our salesmen year by year are becoming more proficient, is a very good indication of our future prospects.

New business on an increasing scale, as I have explained in the past, requires additional finance and therefore, in June of last year, having secured the permission of the C.I.C., we made a Rights Issue of 640,000 Ordinary shares at 7s. 6d. per share, and it is most gratifying to record that 92·5% of the shareholders took up their allotments, and that for the small balance of 36,000 shares, 1,462 shareholders applied for a total of over 906,000 shares. This in itself is a tribute to your faith in the present and future prosperity of the Company.

You will see from a perusal of the Accounts that the liquid position of the Company is extremely healthy and the indications are that we should not have to raise fresh Capital for some while to come.

Taking it altogether on the Home Front it looks as though the year 1955 will be equally as successful as the year under review, and business for the first four months of this year has exceeded our target figure.

Overseas

South Africa: I have to report that our two Operating Companies in South Africa continue to be successful and have made good profits during the year. In Johannesburg where we started first, in 1948, the progress made has enabled them to pay a dividend of 10% to our Holding Company in South Africa, and they have also been able to finance their own development. The other Operating Company in the Cape, which is very much smaller, has also made good progress but they are not yet in the position of being able to finance themselves, though there are indications that the day is not too far distant when they will be in that desirable position.

Canada: In Canada, as I told you last year, we only commenced operating in September 1953 and we cannot expect to see any profits for a few years. This is inevitable in starting a rental business from scratch.

The Canadian market is a much tougher one than even we had anticipated, but we have proved that with the right selling approach the business is there to be taken.

Australia: The Company in Australia in which we acquired a half interest, commenced trading under its new title of T.R. Services (Pty.) Limited, at the beginning of 1954. There is much yet to be done to bring this business into line with our own, but things are moving extremely well, business is good, prospects are good, and the only uncertainty is the Australian Import situation. To what extent that is likely to retard the progress of our Australian venture it is impossible to foresee at this stage.

Paris: For some years past our Paris Company, Le Teleautomate, has been busily seeking new lines of business to replace the diminishing telephone business, and in particular their efforts have been directed to the electrical contracting field. From the orders taken and executed in the last couple of years, and the present state of their order book, it appears they have found a solution to their problem.

Despite its many handicaps the Company again made a small profit in 1954, but now that they have some fresh capital, I think we may look forward to increased profits in the future.

Brussels: Our Brussels Subsidiary traded at a profit slightly in excess of that for 1953, and in spite of increasingly severe competition on the Telephone side of the business. Their efforts to develop their business in other directions have met with considerable success, and despite adverse trading conditions in Belgium, we may reasonably look forward to the continued profitability of our Brussels Company.

Profit and Loss Account

The gross Profit at £690,753 shows an increase of £35,184 over the previous year, whereas Profits Tax and Income Tax at £356,844 shows a substantial reduction in the sum of £101,935. Thus our net Profit has taken a considerable jump from £196,790 in 1953 to £333,909 in 1954. You will therefore appreciate that we have every cause to feel grateful to the Chancellor of the Exchequer for removing a little of the crippling burden of taxation, which has so seriously affected our activities in the past few years.

After providing for the Transfer to General Reserve of £200,000 and the dividends on both the Ordinary and Preference Shares amounting to £134,640, we are left with an unappropriated balance of £120,844 to be carried forward to the current year.

Balance Sheet Features

The issued Capital has increased to £2,160,000 as the result of the Rights Issue of £160,000 in June of last year. The Share Premium Account has also increased by £76,548 for the same reason.

The Revenue Reserves now stand at £1,000,000 after the transfer of £200,000 from the Profit and Loss Account.

The Shareholders' interests, consisting of Capital, Reserves, and the unappropriated Balance, amount to £3,419,633 as compared with £2,969,380 at the end of 1953.

Current Liabilities have increased by £165,600.

Turning now to the Assets side of the Balance Sheet, the net value of the revenue bearing Installations is £2,671,239, which is equivalent to 1·45 years' rent.

The increase of £8,635 in the value of Freehold and Leasehold Properties is accounted for by the purchase of additional house property, necessitated by the transfer of staff and to the cost of extensions to our Newcastle Office Premises.

Although the amount invested in our Subsidiary Companies reflects but little change in total, the loans have increased by £18,353 as a result of a further remittance of $50,000 to our Canadian Company.

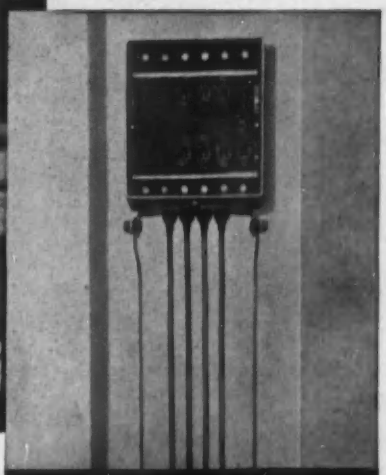
Current Assets have risen by £211,918 which is accounted for by the improvement of £143,732 in our liquid resources, by increased Stocks and Debtors.

Consolidated Accounts

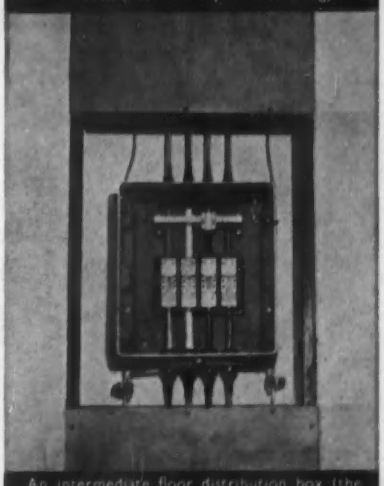
The net Profit of the Group before Taxation is £725,941 compared with £702,430 for 1953. After providing for Taxation, the Transfers to Reserves, and Dividends, the balance of unappropriated Profits carried forward and attributable to the Holding Company's shareholders amounts to £186,848.

The report and accounts were adopted and the final dividend of 8½%, making 12½% for the year, was approved.

INDIA'S TALLEST BUILDING



The top floor distribution box with cover removed (note the duplicate earthing)



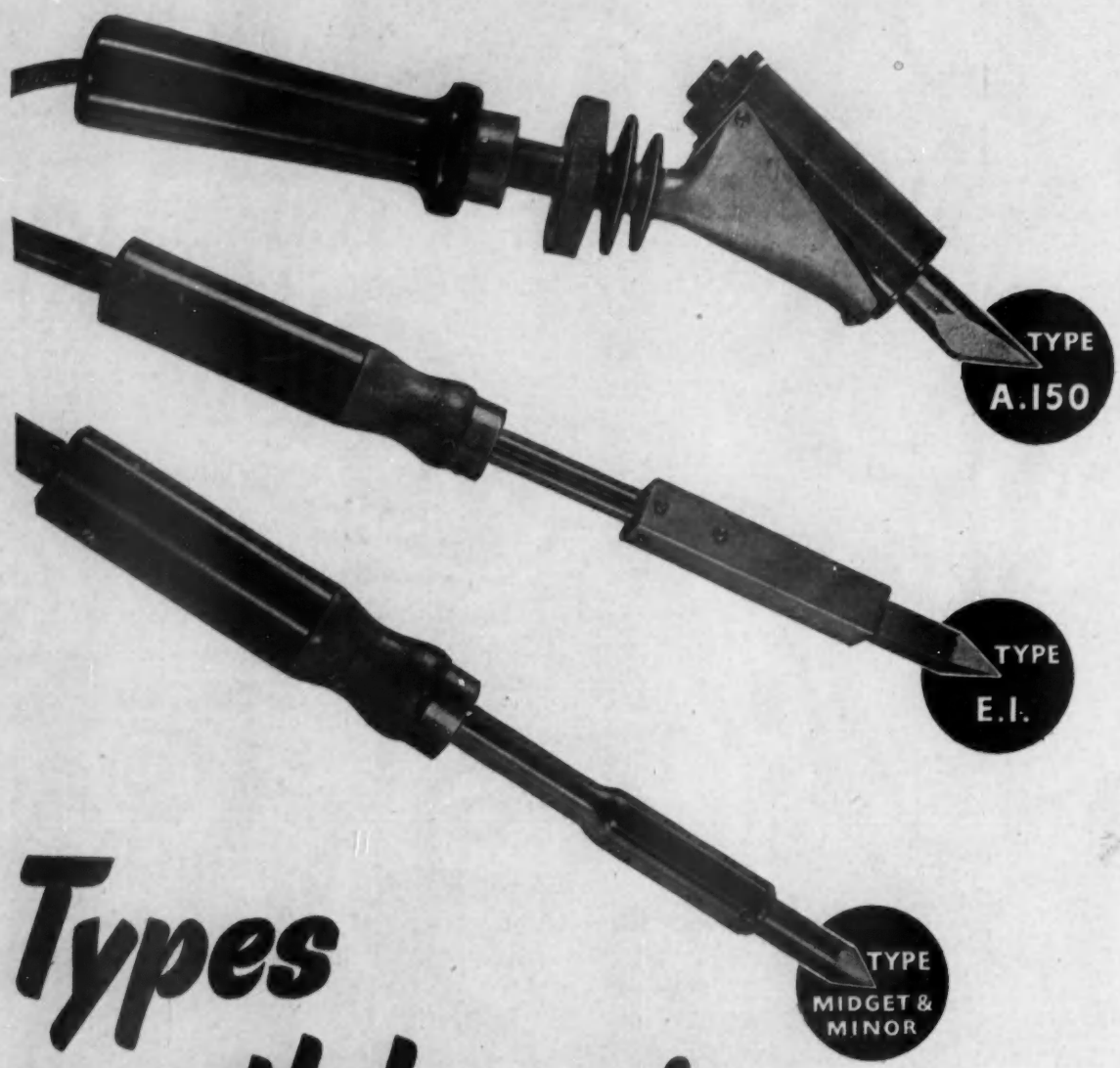
An intermediate floor distribution box (the fuses and insulating shields are removed)

Uses the HENLEY RISING MAIN SYSTEM

This massive thirteen-storey reinforced concrete structure, with an adjoining 6-storey building, provides office accommodation for the Supplementary West Bengal Secretariat in Calcutta. With an approximate floor space of 247,000 sq. ft., the demands for electricity for lighting and power are considerable and it is noteworthy therefore, that the Henley Rising Main System has been installed.

The system incorporates all the components necessary for the complete supply installation, and solves the problem of electricity distribution in modern blocks of flats, multi-floored commercial buildings and other similar installations.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



Types worth knowing

British made throughout, the Browleco Electric Soldering Irons are solidly built to stand plenty of hard wear. All parts are renewable and quickly fitted. All Browleco irons are covered by our Guarantee against electrical breakdown for a period of six months Write for leaflet.

GRAngewood 4003 (4 lines)

BROWNING'S ELECTRIC CO., LTD.

BOLEYN CASTLE, UPTON PARK, LONDON, E.13

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY AND COUNTY BOROUGH OF BELFAST
Electricity Department

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

TENDERS are invited for the Supply, Delivery and Erection at the First Extension, Belfast Municipal Electric Power Station West of:

One Passenger/Goods Electric Lift of 2,000 lb carrying capacity.

Form of Tender (N.1723), Conditions, Specification and Drawings, in quintruplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas, which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the tender document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Passenger/Goods Electric Lift, Electricity Department" and endorsed with the name and address of the tenderer must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 11 Aug., 1955.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

C. A. R. SHILLINGTON,
Chairman,
Northern Ireland Joint Electricity Committee.

Chichester House,
Chichester St, Belfast.
23 June, 1955. (T 378)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

OUTER HEBRIDES DISTRIBUTION

TENDERS are invited for the supply and erection of 22 kV and L.V. Distribution Lines on the Islands of North Uist, Berneray, Barra and Vatersay. Copies of the Tender Document may be obtained on application with a cheque for £2. 2s. (returnable) to the Engineers, Messrs. Merz and McLellan, 72a George St, Edinburgh 2. The Board do not bind themselves to accept the lowest or any Tender. H. W. Simpson, Secretary, 16 Rothesay Terr. Edinburgh. (T 336)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

SOUTH OF SCOTLAND ELECTRICITY BOARD
Lanarkshire Area

ENGINEERING APPOINTMENTS

APPLICATIONS are invited for the undernoted Engineering Appointments. The Salaries and Conditions of Service for each appointment will be in accordance with the National Joint Board's Agreement, Schedule A, and the present Classification, Grading and Salary will be as detailed below. The salaries will be subject to the statutory deductions including superannuation. Applicants for each vacancy should possess the necessary technical qualifications.

AREA TRANSFORMER AND PROTECTION TEST DEPARTMENT

(1) ONE FOURTH ASSISTANT ENGINEER (TEST)

Applicants should have had a sound engineering training with some subsequent experience in the testing, repair and maintenance of Feeder Protection Schemes. The present Classification and Grading is K13, salary £675/£720 per annum.

Districts

(2) ONE SECOND ASSISTANT DISTRICT ENGINEER (NEWLANDS DISTRICT)

Applicants should have had a sound engineering training with subsequent experience in the maintenance and operation of H.V. and L.V. Underground and Overhead distribution systems, and H.V. fault location. They should also be conversant with Load Flow diagrams and Short Circuit and Voltage Drop Calculations. The present Classification and Grading is E.7, salary £715/£760 per annum.

(3) FIVE THIRD ASSISTANT DISTRICT ENGINEERS

District	*Present Classification and Grading*	*Present Salary per annum*
(*a*) Coatbridge (Two Third Assistant District Engineers)	F.9	£675/£720
(*b*) Hamilton	E.9	£635/£680
(*c*) Lanark	E.9	£635/£680
(*d*) Motherwell	F.9	£675/£720

Applicants should have had a sound engineering training with some experience in the maintenance and operation of H.V. and L.V. Distribution Systems and should be conversant with Load Flow Diagrams and Voltage Drop Calculations.

(4) ONE FOURTH ASSISTANT DISTRICT ENGINEER (NEWLANDS DISTRICT)

Applicants should have had a sound engineering training with some subsequent experience of H.V. and L.V. Distribution Systems. The present Classification and Grading is E11, salary £555/£600 per annum.

The successful candidate for Appointment No. 1 will require to reside within a reasonable distance of the Area Transformer Testing Station at Motherwell.

The successful candidates for the 7 District Appointments will require to reside within a reasonable distance of their respective District Offices, and to take part in the standby duty rota.

Application Forms, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.

137 Almada St,
Hamilton. (T 329)

SOUTH EASTERN ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER

Purley District

SALARY £675 x £15—£720 under N.J.B. Class F, Grade 9, plus London Allowance. Superannuable. Applicants should be suitably qualified and have had training and experience in the planning, construction, operation and maintenance of overhead and underground distribution systems up to 11 kV. The person appointed will be required to assist on a single/three phase system voltage changeover.

Applications, naming 2 referees, on forms from J. McAlister, B.SC., A.M.I.E.E., District Manager, SEEBoard, Electric House, High St, Purley, Surrey, by 13 July, 1955.

SENIOR CARTOGRAPHIC DRAUGHTSMAN (MALE)

Purley District

Salary £525 x £20—£585 plus London Weighting under N.J.C. Grade 2. Superannuable. Applicants should be suitably qualified and have had responsible experience in a Drawing Office.

Applications, naming 2 referees, on forms from J. McAlister, B.SC., A.M.I.E.E., District Manager, SEEBoard, Electric House, High St, Purley, Surrey, by 13 July, 1955.

CARTOGRAPHIC DRAUGHTSMAN (MALE)

Purley District

Salary £190/£495 per annum plus London Weighting according to age and experience. Superannuable. Preference given to applicant with experience on tracing, map work, mains records and general Drawing Office routine, but training will be given to a suitable junior candidate.

Applications, naming 2 referees, on forms from J. McAlister, B.SC., A.M.I.E.E., District Manager, SEEBoard, Electric House, High St, Purley, Surrey, by 13 July, 1955.

CARTOGRAPHIC DRAUGHTSMAN (MALE)

Worthing District

Salary within range £190/£495 per annum, according to age and experience. Superannuable. Applicants should have a sound general education and experience of general drawing office routine an advantage.

Applications, naming 2 referees, to M. J. Mortimer, M.I.E.E., District Manager, SEEBoard, 56 Chapel Rd, Worthing, Sussex, by 13 July, 1955.

JOINTER (EXTRA HIGH TENSION)

Worthing District

Wages 4s. 1d. per hr, 44-hr, 5-day week under N.J.I.C. Agreement. Superannuation optional.

Applications, naming 2 referees, to M. J. Mortimer, M.I.E.E., District Manager, SEEBoard, 56 Chapel Rd, Worthing, Sussex, by 13 July, 1955.

A. L. BURNELL,
Secretary.
(T 362)

CENTRAL ELECTRICITY AUTHORITY
North West Merseyside and N. Wales Division

VACANCY No. E.166/207/T.—ASSISTANT MAINTENANCE ENGINEER (Elec.), Bold Generating Station. Salary £755/£800 (G.8).

Vacancy No. E.166/226/T.—ASSISTANT SECTION ENGINEER, Kearsley North Transmission Section based at Kearsley Generating Station. Salary £750/£975 (AX/EX.4).

Vacancy No. E.166/228/T.—STATION SHIFT CONTROL ENGINEER Hartshead Generating Station, Stalybridge. Salary £675/£720 (G.10).

Vacancy No. E.166/225/T. — SHIFT CHARGE ENGINEER, Whitehaven Generating Station. Salary £555/£600 (A.7).

Vacancy No. E.166/230/T.—ASSISTANT SHIFT CHARGE ENGINEER, Chadderton "B" Generating Station. Salary £715/£760 (G.9).

Vacancy No. E.166/231/T.—STATION SHIFT CONTROL ENGINEER, Huncoat Generating Station. Salary £635/£680 (F.10).

Applications to Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, before 9 July. Quote vacancy No. (T 345)

LONDON ELECTRICITY BOARD

SENIOR AND ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and they are graded under Schedule D of the National Joint Board agreement.

ENGINEERING DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 6, £535, 10s./£661, 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
(AT WOOLWICH, S.E.18)

Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

Hampstead/Willesden District

(DESIGN AND PLANNING)

Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(BASED AT STRATFORD, E.15)

Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawing; plant layout in substations; layouts and site plans of mains work; electrical diagrams.

St. Marylebone/St. Pancras District

(DESIGN AND PLANNING)

Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

DESIGN AND PLANNING BRANCH
(BASED AT ALDERSGATE ST., E.C.1)

Vacancy No. V/1965/T

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1947/T

Candidates must have had a good general and technical education up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

North Eastern Sub-Area

WEST HAM DISTRICT
(BASED AT STRATFORD, E.15)

Vacancy No. V/1939/T

Candidates should have had a good general and technical education up to Ordinary National Certificate standard. They should have had considerable experience in transformer chamber layouts, mains records and system diagrams. Knowledge of building construction would be an advantage.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1980/T

Candidates should have had a good general and technical education up to Ordinary National Certificate standard, be

continued in next column

continued from previous column

neat and capable draughtsmen and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Candidates should be experienced in surveying E.H.V. cable routes and have had good experience in making accurate surveys of cable routes during the laying of E.H.V. cables, taking information and sketches on site and producing final drawings.

Chief Engineer's Department

(AT STAMFORD ST., S.E.1)

Vacancy No. V/1989/T

Applicants, required for plant layout, should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of transforming plant, H.V. switchgear and cables up to 66 kV. (In this instance an appointment may be made within Grade 5, £672/£777 per annum inclusive.)

SENIOR DRAUGHTSMEN

Commencing salaries dependent upon qualifications and experience within Grade 5, £672/£777 per annum, inclusive of London Allowance.

Southern Sub-Area

(BASED AT BECKENHAM, KENT)

Vacancy No. V/1979/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil enginering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Contracting Section

(AT STRATFORD PLACE, W.1)

Vacancy No. V/1986/T

Applicants should be capable of completing layouts of plant and associated cabling for large industrial installations.

Hampstead/Willesden District

(AT HAMPSTEAD, N.W.3)

Vacancy No. V/1998/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

St. Marylebone/St. Pancras District

(AT AYBROOK ST, W.1.)

Vacancy No. V/2001/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in a mains records office dealing with systems of all voltages up to 11 kV. In addition, the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)

Vacancy No. V/1966/T

Candidates must have had a sound general education with technical qualifications equivalent to the Higher National Certificate in electrical engineering. They should have had some workshop training and mechanical experience, and must be conversant with the layout of switchgear and plant up to 11 kV for small substations, including preparation of associated electrical diagrams. A knowledge of building and R.C. structures, whilst not essential, would be an advantage.

Application forms for the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred.

(T 351)

COUNTY BOROUGH OF WEST HAM EDUCATION COMMITTEE

WEST HAM COLLEGE OF TECHNOLOGY
ROMFORD ROAD, STRATFORD, E.15

REQUIRED: ELECTRICIAN for electrical maintenance of College and Laboratory Equipment in Electrical Engineering Department.

Wages in accordance with current rate of Electrical Contracting Industry. Weekly hours of duty: 44.

Application forms, obtainable from the undersigned, should be returned not later than 15 July, 1955.

R. OPENSHAW,
Chief Education Officer.

95 The Grove,
Stratford, E.15. (T 327)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

Leeds District

SECOND ASSISTANT DISTRICT ENGINEER

APPLICANTS should be Corporate Members of the Institution of Electrical Engineers, or hold equivalent qualifications. They must have wide experience of a large city network in design, construction, operation and maintenance covering H.V. and M.V. overhead and underground distribution, together with substation equipment. Experience in the changeover of non-standard A.C. systems will be an added advantage.

Applicants must be prepared to reside within the district and also to undertake standby duties.

Salary—N.J.B. Class K, Grade 7, £925/£25/£1,050 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 14 July, 1955.

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Candidates should be fully experienced in the operation and maintenance of H.V. and L.V. overhead and underground transmission and distribution systems, substation plant and ancillary equipment. They should be suitably qualified and hold at least the Higher National Certificate in Electrical Engineering.

Salary—N.J.B. Class H, Grade 10, £715/£15/£760 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 14 July, 1955.

No. 1 (Bradford) Sub-Area

Otley District

GENERAL ASSISTANT DISTRICT ENGINEERS
(TWO POSTS)

Applicants should hold the Higher National Certificate in Electrical Engineering or acceptable equivalent qualifications, and have had training and experience in the construction, operation and maintenance of high voltage overhead and underground distribution systems.

Salary—N.J.B. Class E, Grade 13, £475/£15/£520 per annum.

Keighley District

GENERAL ASSISTANT DISTRICT ENGINEER

Applicants should hold the Higher National Certificate in Electrical Engineering or acceptable equivalent qualifications, and have had training and experience in the construction, operation and maintenance of high voltage overhead and underground distribution systems.

Salary—N.J.B. Class F, Grade 14, £475/£15/£520 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 14 July, 1955. (T 350)

CENTRAL ELECTRICITY AUTHORITY
South Western Division
TECHNICAL STAFF VACANCIES

(*a*) DEPUTY POWER STATION SUPERINTENDENT, East Yelland Power Station, N.J.B., G.3, £1,035/£1,125.

(*b*) MAINTENANCE ENGINEER (Electrical), East Yelland Power Station, N.J.B., G.6, £840/£900.

(*c*) SHIFT CHARGE ENGINEERS, Portishead "A" Power Station, N.J.B., J.7, £900/£975.

(*d*) ASSISTANT SHIFT CHARGE ENGINEERS, East Yelland Power Station, N.J.B., G.9, £715/£760.

(*e*) ASSISTANT SHIFT CHARGE ENGINEER, Plymouth "B" Power Station, N.J.B., G.9, £715/£760.

(*f*) BOILER HOUSE SHIFT CHARGE ENGINEER, Portishead "A" Power Station, N.J.B., J.9, £790/£850.

Superannuation.

Applicants for (*a*) should have had sound technical education and considerable practical experience in operation, maintenance and administration of a modern power station.

For (*b*) should have had wide experience in maintenance of modern plant.

For (*c*) should have had considerable experience in a modern power station.

For (*d*) and (*e*) should have had sound technical training and practical operating experience in a modern power station.

For (*f*) should have had sound mechanical training and experience in the design and operation of high pressure boiler plant.

For all above appointments membership of a recognised Engineering Institution or equivalent desirable.

Application Forms obtainable from R. C. Barrett, Esq., Divisional Secretary, 26 Oakfield, Rd, Bristol 8, should be completed and returned by 11 July, 1955. (T 365)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Central Area
SECOND ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT) AT AREA HEADQUARTERS

APPLICATIONS are invited for the above appointment for which the salary and conditions of service will be in accordance with the National Joint Board Agreement, Class G, Grade 7 (£790/£850 per annum) (subject to Statutory deductions and superannuation).

The successful candidate will be required to reside within a reasonable distance of Stirling and the minimum qualification required is a Higher National Certificate in Electrical Engineering, or the equivalent. Experience in the planning and design of electricity supply systems—rural and urban—up to 33 kV is essential.

Application forms, which can be had from the undersigned, are to be lodged not later than Tuesday, 12 July, 1955.

JAMES G. CURTIS,
Area Manager.

"Woodlands,"
St. Ninians Rd,
Stirling.
21 June, 1955. (T 326)

CENTRAL ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division
APPLICATIONS are invited for the post of SENIOR DRAUGHTSMAN (Mech.) in the Construction Department, Springwood House, Woolton, Liverpool. Applicants should have a good general and technical education, preferably possess H.N.C. in engineering, and experience in a Drawing Office associated with the layout of turbo alternator sets and ancillary plants would be an advantage.

The successful applicant will be required to prepare drawings and diagrams associated with power station plant and equipment, and check contractors' drawings. Salary within the range £750 x £20—£850 (Grade 4, Schedule D).

Applications stating age, experience and present position should be sent to the Divisional Secretary, Central Electricity House, 825 Wilmslow Rd, Manchester 20, without delay. Please quote vacancy No. E.159/209/T. (T 323)

MIDLANDS ELECTRICITY BOARD
APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area
SECOND ASSISTANT DISTRICT ENGINEER (DEAN FOREST DISTRICT)

Experience necessary in all branches of distribution work including construction, maintenance and operation of High and Low Voltage systems and substations, and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £675/£720 per annum (N.J.B. Class D, Grade 7).

THIRD ASSISTANT DISTRICT ENGINEER (DEAN FOREST DISTRICT)

Applicants should have had a sound technical training and experience in the construction, maintenance and operation of overhead and underground systems and substations. Technical qualifications desirable. Salary £595/£640 per annum (N.J.B. Class D, Grade 9).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

Shropshire and Herefordshire Sub-Area
THIRD ASSISTANT DISTRICT ENGINEER (KNIGHTON BRANCH, LUDLOW DISTRICT)

Duties involve the supervision of commercial activities in the Knighton area, including control of Service Centre, meter reading, etc., also replacement of H.V. and L.V. Fuses on distribution system. Salary £595/£640 per annum (N.J.B. Grade 9).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

Worcester and District Sub-Area
THIRD ASSISTANT DISTRICT ENGINEER (REDDITCH DISTRICT)

Duties involve the construction, maintenance and operation of E.H.V. and L.V. mains and substations, and planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. Class E, Grade 9).

Apply in writing, within fourteen days, stating age, experience, present salary and position to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
(T 373)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division
APPLICATIONS are invited for the following posts:

FOURTH ASSISTANT ENGINEER (EFFICIENCY AND TESTING)
GENERATION (OPERATION) DEPARTMENT
Divisional Headquarters, North London

Salary N.J.B. Schedule C, Class AX/DX, Grade 6, £600 x £25 £725/£785 per annum plus London Weighting.

Applicants should have a degree or commensurate qualifications, some testing experience and knowledge of instrumentation is desirable. Duties will cover testing of Generating Station Plant and investigations of a varied nature.

GENERAL ASSISTANT ENGINEER
NORWICH GENERATING STATION

Salary Class F, Grade 14, £475 x £15—£520 per annum.

The duties of the successful applicant will include assisting in the Control Room on Shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a Generating Station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by 9 July, 1955.

W. N. C. CLINCH,
Controller.
(T348)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY
Aldermaston, Berks
requires an ENGINEER, GRADE III, to design and prepare intricate electronic equipment for the instrumentation and telemetry of equipment undergoing flying trials. Duties will include assisting in the planning and control of the flying trials and liaison with production groups, both within the Establishment and with outside firms engaged on small-scale production of the instrumentation and telemetry equipment. Applicants should have served a recognised engineering apprenticeship and be corporate members of the Institution of Electrical Engineers or have exempting qualifications. Experience of electronic and radio frequency design work is essential and familiarity with trials procedure would be a distinct advantage.

Salary: £695/£1,065 per annum (male).

Superannuation. The successful applicant will be required to join the Authority's contributory scheme.

Housing. Housing accommodation will be available within a reasonable period for married officers who live outside the radius of the Establishment's transport facilities or alternatively the Authority may be able to assist successful applicants in the purchase of a house. During this period a lodging allowance may be payable.

Requests for application form by postcard to Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quote reference 682/WGE/49. (T 324)

CENTRAL ELECTRICITY AUTHORITY
Poole Generating Station
INSTRUMENT MECHANIC

APPLICANTS should have experience in Power Station instruments, including, Multelecs, Flow Meters, Pyrometers and Automatic Control. Some knowledge of Electronics preferred.

The rate of pay will be 4s. 1d. per hour for a 44-hour, five-day week, and the conditions of employment will be in accordance with the N.J.I.C. Agreement for the Electricity Industry. Superannuation scheme, social club, and good canteen facilities. Applications in writing to Station Superintendent, Poole Generating Station, Rigler Rd, Hamworthy, by 8 July, 1955. (T 328)

SOUTH WESTERN ELECTRICITY BOARD
GENERAL ASSISTANT ENGINEER COMMERCIAL
PLYMOUTH DISTRICT

SALARY N.J.B. Class F, Grade 12—£555 x £15—£600 per annum.

The duties involve general assistance to the District Commercial Engineer in commercial matters, particularly with regard to contracting work. Candidates should possess a current driving licence.

Application forms, obtainable from the District Manager, South Western Electricity Board, Armada St, Plymouth, should be returned by 16 July, 1955. (T 358)

CENTRAL ELECTRICITY AUTHORITY
London Division
APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
BARKING "C" GENERATING STATION
(Vacancy No. 55/476)

Wide experience required in maintenance of modern Generating Plant and control of Labour. Duties include organising and planning of overhauls of Turbine and Boiler Plant and associated equipment.

Salary Class J, Grade 8, £882 per annum.

Applications quoting vacancy number, may be made on the standard form obtainable from the Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (T 346)

BRUSH ELECTRICAL ENGINEERING CO. LTD., Loughborough

OUTSIDE SALES ENGINEERS

THERE are vacancies for additional staff in all parts of the British Isles, and applications are invited from qualified electrical engineers with relevant experience, in the approximate age range of 28 to 45.

These vacancies carry generous salaries and adequate expense allowances, and a car is provided. There are good opportunities for promotion and a non-contributory assurance scheme is in operation.

Written applications should be addressed to the Personnel Director, the Brush Group Ltd., Duke's Court, 32 Duke St, St. James's, London, S.W.1. (T 339)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER, EAST DISTRICT, MANCHESTER

THE duties will be to assist on substation construction, maintenance and operation and the keeping of necessary records, but will not be restricted to this class of work. Applicants should have Higher National Certificate in Electrical Engineering, and should have had practical experience on substation work, operation, cable laying and jointing, etc. Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £635 x £15—£680 per annum, Grade 11, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1, Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 9 July, 1955.

SECOND ASSISTANT ENGINEER (SYSTEM PLANNING AND DEVELOPMENT) SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, BOLTON

Candidates must have had a sound training in Electrical Engineering and should have either a degree, H.N.C. or equivalent qualifications. They should also have responsible experience in several of the following branches:

(1) Planning and construction of 33 kV and lower voltage systems.
(2) Maintenance and operation of 33 kV and lower voltage systems.
(3) Substation design and construction.
(4) Calculation of fault levels, etc.
(5) Application of Protective Gear.
(6) Planning and Installation of Telecommunication, Supervisory and Ripple Control Equipment.
(7) Estimating and Specification of Distribution Plant.

Salary Scale: £1,035 x £30—£1,125 per annum, Grade L.7, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, by 9 July, 1955.

SUB-AREA SENIOR HOUSECRAFT ADVISER (FEMALE) SUB-AREA CONSUMERS' ENGINEER'S DEPARTMENT, OLDHAM

Applicants must be experienced in the organisation of public demonstrations of electrical domestic appliances, the supervision and training of demonstration staff, and should hold the E.A.W. Housecraft Diploma or possess other equally suitable qualifications.

Salary Scale: £585/£645 per annum, Grade 3, N.J.C. Conditions.

Applications to Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, by 9 July, 1955.

THIRD ASSISTANT ENGINEER (SYSTEM PLANNING AND DESIGN) SUB-AREA ENGINEER'S DEPARTMENT, BLACKBURN

Applicants should have had a sound training in Electrical Engineering and should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications.

The duties of the post will include the preparation of schemes and estimates for high and low voltage networks, and system calculations. Practical experience on the construction and operation of high and low voltage systems will be an advantage.

Salary Scale: £790 x £20—£850 per annum, Grade K.10, N.J.B. Conditions.

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Applications to Sub-Area Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 9 July, 1955.

FOURTH ASSISTANT DISTRICT ENGINEER, WORKINGTON DISTRICT

Applicants should be experienced in all types of rural and urban distribution work up to 11 kV. Preference will be given to holders of H.N.C. in Electrical Engineering.

Salary Scale: £555 x £15—£600 per annum, Grade E.11, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 9 July, 1955.

THIRD ASSISTANT ENGINEER (PLANNING) SUB-AREA ENGINEER'S DEPARTMENT, HAZEL GROVE

Applicants should have had experience in planning and estimating H.V. and L.V. network and substation layouts, and have a knowledge of system calculations and protective gear applications. H.N.C. (or equivalent) in Electrical Engineering essential.

Salary Scale: £715 x £15—£760 per annum, Grade H.10, N.J.B. Conditions.

NOTE.—Applicants who applied in response to the previous advertisement of this post need not re-apply.

DISTRICT COMMERCIAL ENGINEER, MACCLESFIELD DISTRICT

Duties will include:

Organisation and control of all commercial staff and functions in the District; supply of information and advice to consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services; organisation and supervision of maintenance work on consumers' premises including emergency service, routine testing and repair of domestic appliances, including control of workshops; control of Service Centres and Exhibitions.

Salary Scale: £1,035 x £30—£1,125 per annum, Grade F.2, N.J.B. Conditions.

Application forms for the above posts can be obtained from the Sub-Area Manager, No. 7 Sub-Area, The North Western Electricity Board, Sub-Area Headquarters, Chapel St, Hazel Grove, Cheshire, and must be returned to him by 9 July, 1955. (T 349)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

BOILER HOUSE SHIFT CHARGE ENGINEER is required at Nechells "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade J9, commencing at £790 per annum.

Experience is required in the operation and maintenance of steam generating plant and main switchgear in a large modern power station, appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 977MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 16 July, 1955. (T 340)

SOUTHERN ELECTRICITY BOARD

CARTOGRAPHIC AND RECORDING DRAUGHTSMAN

BASINGSTOKE District of No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 2, commencing at £525 per annum. N.J.C. Conditions of Service.

Candidates must be experienced in working on drawings of mains and mains equipment. The successful applicant will be required to supervise the working of other Cartographic and Recording draughtsmen and should be conversant with drawing office procedures. Preferences given to applicants possessing General Certificate of Education, or equivalent, or those in training for Ordinary National Certificate in Electrical Engineering.

The successful candidate will be required to contribute to the C.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes, suitably endorsed, not later than 15 July, 1955. (T 361)

SOUTH WALES ELECTRICITY BOARD

require a FIRST ASSISTANT in the Commercial Department, District 223, Swansea, West Central Sub-Area.

Applicants must have had experience in the application of electricity in all its branches; negotiations of supplies, public lighting and contracting.

Salary—Class F, Grade 5 (£840/£900) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 9 July, 1955.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (T 359)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation Operation Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule A of the Agreement:

(*a*) BOILER HOUSE SHIFT CHARGE ENGINEER, Nechells "A" Power Station. Grade F9, £675/£720 per annum. (Vacancy No. 978MD.)
(*b*) ASSISTANT ENGINEER, Hams Hall "A" Power Station. Grade J12, £675/£720 per annum. (Vacancy No. 979MD.)
(*c*) SHIFT CHARGE ENGINEER, Stoke Power Station. Grade E7, £715/£760 per annum. (Vacancy No. 980MD.)
(*d*) STATION SHIFT CONTROL ENGINEER, Ocker Hill Power Station. Grade F10, £635/£680 per annum. (Vacancy No. 981MD.)

Applicants should have a sound technical training and practical experience, in particular for (*a*) and (*c*) the operation and maintenance of steam generating plant and main switchgear, for (*b*) control of the works supply system and for (*d*) the control of steam generating plant and main switchgear. Appropriate technical qualifications will be an advantage.

Apply, quoting the vacancy number, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 16 July, 1955. (T 360)

CITY OF PORT ELIZABETH
Electricity Department

VACANCY FOR METER MECHANICIAN AND TESTER

APPLICATIONS are invited for the permanent position of Meter Mechanician and Tester at a rate of 3s. 11d. per hour, plus Cost of Living Allowance, which is, at present 68s. per week for single employees and 101s. 6d. per week for married employees. In addition, merit pay will be payable in terms of the Conditions of Service.

Applicants must be fully experienced and be capable of testing and calibrating polyphase kWh, kVA and MDI meters, standardisation of instruments and transformers and be thoroughly familiar with the general routine in the Meter Department of a modern electricity supply undertaking.

Further details regarding leave, merit pay, pension fund, etc., can be obtained from Davis and Soper Ltd., 52 and 54 St. Mary Axe, London, E.C.3.

G. H. BREWER,
Town Clerk.

20 June, 1955. (T 325)

CENTRAL ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 70/55.

APPLICATIONS invited for superannuable N.J.B. appointment of MAINTENANCE ENGINEER (Mechanical) at Cardiff Power Station.

Salary: F.6—£790 x £20—£850.

Candidates should be Corporate Members of the Institution of Mechanical Engineers and have had wide experience of Power Station mechanical maintenance.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 13 July, 1955. (T 363)

CENTRAL ELECTRICITY AUTHORITY
Yorkshire Division

APPLICATIONS are invited for the appointment of STATION CHEMIST at Wakefield "B" Power Station, which will have an ultimate capacity of 240 MW.

Salary £840/£900 per annum, Class H, Grade 7, rising to Class J, £900/£975 per annum.

Applicants should hold a minimum qualification of Higher National Certificate in Chemistry and have had previous power station experience. A sound knowledge of power station practice associated with pulverised fuel-fired high-pressure boilers would be considered advantageous.

Application forms obtainable from Divisional Secretary (Establishments), Central Electricity House, St. Mary's Rd, Leeds 7, should be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(T 379)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SECOND ASSISTANT ENGINEER
(MECHANICAL)
GENERATION (CONSTRUCTION)
DEPARTMENT
Vacancy No. 101/55/ET

Preference will be given to applicants who hold a degree in Mechanical Engineering, are Corporate Members of the Institution of Mechanical Engineers, or possess equivalent qualifications. Some electrical training and experience will be a recommendation.

They should be experienced in the design and construction of turbo-alternators, boilers, coal and ash-handling plant, high-pressure steam and water piping and other ancillary work.

Experience in the preparation of specifications and estimates and a knowledge of thermo-dynamics and hydraulics will be an advantage.

Salary will be within Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 11 July, 1955.

THIRD ASSISTANT ENGINEER (MECHANICAL)
GENERATION (CONSTRUCTION)
DEPARTMENT
Vacancy No. 102/55/ET

Applicants should have had a fundamental training in mechanical engineering, including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in Modern Power Stations. Preference will be given to candidates who possess a University degree or equivalent qualification in Mechanical Engineering.

Salary will be within Class AX/DX, Grade 4 (£750/£950 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 11 July, 1955.

GENERAL ASSISTANT ENGINEER (CHEMIST)
STAYTHORPE POWER STATION,
NEAR NEWARK
Vacancy No. 100/55/ET

Candidates must have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry (or equivalent qualifications).

Salary will be within Class J, Grade 16 (£515 x £15—£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 11 July, 1955.

SHIFT CHARGE ENGINEER
DERBY POWER STATION
Vacancy No. 103/55/ET

Applicants should have had a sound technical training and considerable experience in a modern generating station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications and knowledge of Pulverised Fuel Firing will be an advantage.

Salary will be within Class F, Grade 7 (£755 x £15—£800 per annum) of the

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National Joint Board Agreement.

Closing date for receipt of applications: 18 July, 1955.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
STAYTHORPE POWER STATION
Vacancy No. 105/55/ET

Applicants should have had a sound practical and technical training and previous experience of Power Station electrical maintenance is desirable.

Preference will be given to Engineers in possession of, or qualifications leading to, Corporate Membership of the Institution of Electrical Engineers.

Salary will be within Class J, Grade 8 (£840 x £20—£900 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 18 July, 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
24 June, 1955. (T 366)

CENTRAL ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 72/55

APPLICATIONS invited for superannuable N.J.B. appointment of SHIFT CHARGE ENGINEER, Uskmouth Power Station near Newport.

Salary K.7, £975 x £25—£1,050.

Applicants should have obtained H.N.C. and served a regular apprenticeship.

Operating experience in a modern Power Station essential.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 11 July, 1955. (T 376)

COUNTY BOROUGH OF CROYDON

ELECTRICAL ENGINEERING ASSISTANT

APPLICATIONS for this appointment are invited from suitably qualified persons with experience in the preparation of estimates, drawings and specifications for electrical installations in all types of buildings. Experience in the maintenance of existing installations would be an advantage. Salary—Grade APT 4—£675 x £30—£825, plus London Weighting (£30 at age 26). Application forms, with further particulars, from Borough Engineer, Town Hall, Croydon. Closing date 11 July, 1955.

E. TABERNER,
Town Clerk.
(T 337)

CENTRAL ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER in the Generation (Operation) Department, Carliol House, Newcastle upon Tyne.

The appointment offers considerable scope to an engineer interested in problems connected with the operation of large steam driven prime movers.

Applicants should preferably either have a University Degree in Mechanical or Electrical Engineering or be graduates of the appropriate Institution.

The salary for the appointment (which is superannuable) will be in accordance with Grade 4, Schedule C, of the National Joint Board Agreement (£750/£950) per annum and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 22 July, 1955. (T 347)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Essex Sub-Area

Chelmsford District
131/55.R.
FOURTH ASSISTANT ENGINEER

Candidates should have had a sound training in electrical engineering and experience in the construction, operation and maintenance of H.V. and L.V. underground and overhead distribution systems, including substations.

Salary—N.J.B. Class E, Grade 11 (£555/£600).

Apply, by letter, within 14 days, to the District Manager, Eastern Electricity Board, Anchor St, Chelmsford, Essex.

Northmet Sub-Area

Headquarters, London, N.14
122/55.R.
GENERAL ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Candidates should have had a good general and technical education and possess the Higher National Certificate or equivalent qualification. Experience in the carrying out of switching operations, testing and commissioning of protective gear and fault investigation in the field on mains and plant will be an advantage.

Salary—N.J.B. Class M, Grade 16 (£635/£680) plus London Allowance.

Apply, by letter, within 14 days, to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14. (T 375)

CENTRAL ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following post:

SHIFT CHARGE ENGINEER
EARLEY GENERATING STATION, READING
S/13.683

Applicants should possess technical qualifications admitting to corporate membership of a recognised professional institution, and have had previous operating experience involving responsibility in a large modern generating station with high temperatures and pressures and preferably with pulverised fuel equipment.

Salary: N.J.B., Grade G.7, £790/£850.

Special application forms obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 13 July, 1955. Please quote reference E.T. (T 374)

CITY OF PORT ELIZABETH
Cape Province, South Africa

VACANCY—TECHNICAL ENGINEER

APPLICATIONS are invited for the above position in the Electricity Department in Grade 3 (£840 x £48—£1,080). Commencing salary will be determined according to experience and qualifications. The total emoluments, including present cost of living allowance, will be between £1,140 and £1,380 for married, and £936 and £1,080 for single persons.

Preference will be given to candidates who possess a degree in Electrical Engineering and Corporate Membership of a recognised Engineering Institute. Applicants should have wide experience in the technical work associated with the Generation and Distribution Branches of a large electricity undertaking.

The appointment will be subject to the Council's Conditions of Service and Leave Regulations.

Applications, stating age, marital state, qualifications and experience, must be submitted along with testimonials, to Davis and Soper Ltd., 52 and 54 St. Mary Axe, London, E.C.3, not later than 21 July, 1955. 24 June, 1955. (T 357)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 71/55.

APPLICATIONS are invited for the superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER (Testing, Efficiency and Combustion) in the Generation (Operation) Department, Divisional Headquarters.

Salary: AX/DX6—£600/£785 per annum.

Candidates should hold Higher National Certificate or equivalent qualifications and have experience of power station operation.

Previous experience of power plant testing advantageous.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 13 July, 1955. (T 364)

CHIEF ACCOUNTANT

required for Electricity Department, GOLD COAST Local Civil Service for two tours of 18 to 24 months each. Salary (consolidated) £2,500 a year, Gratuity at the rate of £150 a year. Free passages. Liberal leave on full salary. Candidates, not less than 35 years of age, must be qualified accountants and have had at least five years' high grade experience in a responsible accountancy position in a commercially operated electricity undertaking. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M1B/35108/EE. (T 380)

A SKILLED ARMATURE WINDER/FITTER for assembly of wide range of electric motors, etc. Must have repair shop experience. Excellent prospects. Lewis Electric Motors Ltd., Moor Works, Maidenhead, Berks. (T 188)

APPLICATIONS are invited for a post as LABORATORY DEMONSTRATOR in the School of Electronics. A technical qualification equivalent to a Higher National Certificate or Diploma, together with good knowledge of electronics, is essential. The successful candidates will be required to assist with Laboratory instruction to students, and generally supervise the maintenance and development of the laboratory equipment. Please write for application form giving details of age, experience and qualifications to: Personnel Manager, Automatic Telephone and Electric Co., Ltd., Strowger Works, Liverpool 7. (T 294)

AN ASSISTANT DEVELOPMENT ENGINEER is required by a Company in Cardiff manufacturing cartridge fuse-links. Applicants must possess O.N.C. as a minimum qualification and have experience in a similar capacity. An attractive commencing salary will be paid. Applications in strictest confidence to Personnel Officer, Hopkinson Electric Co., Birchgrove, Cardiff. (T 253)

The Parsons and Marine Engineering Turbine Research and Development Association

has two vacancies for

RESEARCH ENGINEERS

with Engineering Degree or equivalent, for interesting and varied work on full scale trials of prototype steam machinery installations. Duties include the planning of trials, analysis of results and the writing of reports. Experience of steam plant operation is desirable but not essential. Salaries compare favourably with the Scientific Civil Service and there are superannuation and other benefits.

Applications in writing, stating age and experience, should be addressed to the

Research Director,
Pametrada Research Station,
Wallsend, Northumberland.

(T 308p)

A Senior

SWITCHGEAR PROTECTION ENGINEER

is required by a leading British Manufacturer in the Midlands to lead a section dealing with the protection of E.H.T. Switchgear. Good knowledge of distance impedance carrier current, bus zone, differential protection essential. Apply in strict confidence to:

Box No. 4631, Electrical Times
Sardinia House, Sardinia St,
London, W.C.2

(T 355p)

A DESIGN ENGINEER is required by a Company in Cardiff manufacturing electrically-rotated machinery, 1-100 h.p. Applicants should possess minimum qualifications of Higher National Certificate, and possess some experience in similar capacity. An attractive commencing salary will be paid and the successful candidate will become a member of an enthusiastic design team. Applications in strictest confidence to Personnel Officer, Brush Electrical Engineering Co., Ltd., Hopkinson Works, Birchgrove, Cardiff. (T 254)

AN ELECTRICAL ENGINEER is required to assist the Chief of Test, Rotating Electrical Machines Division, Brush Electrical Engineering Co., Ltd., Loughborough, Leics. The duties will be concerned with the planning and reorganisation of the test department. Applicants should hold qualifications suitable for corporate membership of the I.E.E., and have experience of machine testing. Knowledge of design and/or electronics advantageous. This is a good opportunity for a man having a flair for organisation and offers excellent prospects of advancement. Salary commensurate with qualifications and experience. Conditions include non-contributory superannuation. Please reply with full details to the Chief Personnel Officer. (T 338)

ASSISTANT to Export Manager, age 30/40, required by manufacturers of specialist electrical control gear with works 20 miles west of London. Higher National Certificate or equivalent. Ability to handle technical and commercial correspondence and small staff. Good prospects and pension scheme. Commencing salary £850 per annum.—Box No. 4597, Electrical Times. (T 193)

CONNOLLYS (BLACKLEY) LIMITED require two additional REPRESENTATIVES for their Cable Division to call on Electricity Authorities, Contractors, Wholesalers, etc.

(*a*) MIDLANDS AREA—territory embracing the Midlands and East Midlands Electricity Boards.

(*b*) SOUTHERN AREA—territory embracing L.E.B., S.E.E.B., S.E.B. and Eastern Electricity Boards.

Car provided, superannuation scheme in operation. Applications giving full particulars and salary required will be treated in strictest confidence and should be addressed to the Sales Manager, Connollys (Blackley) Limited, Manchester 9, and marked "Confidential." (T 309)

CENTRAL ELECTRICITY AUTHORITY
London Headquarters, Chief Engineer's Department (Generation Design Branch), have vacancies for:

SECOND ASSISTANT ENGINEER (Instrumentation and Controls). Salary N.J.B. Grade 2, £971/£1,325 per annum inclusive. Duties—to assist in technical investigation of problems associated with instrumentation and control of power station plant and in the preparation of specifications and examinations of tenders. Candidates should have a degree in mechanical or electrical engineering or equivalent qualification and experience in the manufacture of instruments and control equipment. Some knowledge of electronics would be an advantage.

FOURTH ASSISTANT ENGINEER (Electrical Section). Salary N.J.B. Grade 4, £709/£893 per annum inclusive. Duties—to assist in investigation into design problems associated with electrical equipment for power stations. Candidates should have an engineering degree or equivalent qualification and some experience in manufacturing design of power transformers or rotating electrical machines.

Application forms may be obtained from D. Moffat, Director of Establishments, Winsley St, W.1, to be received not later than 18 July, 1955, please quote Ref. AE611. (T 332)

COMMERCIAL ELECTRICAL ENGINEER required by Merchant Company for Malaya. Minimum qualification O.N.C.; B.T.H.-trained man preferred; age up to 24; bachelor. Commencing total emoluments not less than £875 per annum paid in Straits Dollars. Annual increments; Provident Fund; Pension Scheme; free furnished accommodation; passage provided. Write—Box No. 1429, c/o Abbotts, Eastcheap, London, E.C.3. (T 352)

ELECTRICAL DRAUGHTSMEN—Senior and Junior required for design and detail of large industrial and chemical projects. Applications, giving details of technical training and office experience, to George Wimpey and Co., Ltd., Mechanical Division, 27 Hammersmith Grove, London, W.6. (T 381)

ENGINEERS wanted by large firm of Power Cable Installation Contractors, preferably with some practical experience of outside Contract work (age group 25/45). Pension Fund and good Staff conditions. Apply in writing, quoting reference C/71/55 to—Box No. 4621, Electrical Times. (T 341)

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Wilton Works

ENGINEERS

Mechanical, Structural,
Electrical, Civil,

PERMANENT STAFF APPOINTMENTS await young Graduate Engineers with good Honours Degrees. The Wilton Works Site of 2,000 ACRES IN COURSE OF DEVELOPMENT in addition to providing general and varied experience in modern Engineering has its own special problems in design and materials.

The organisation is expanding and has opportunities for technical training followed by further training towards higher management.

Situated in the North Riding of Yorkshire near the Coast, Wilton offers first class working conditions, five-day working week, Pension Fund, and full recreational facilities.

Write for application form to Staff Officer, Imperial Chemical Industries Limited, Wilton Works, Middlesbrough, Yorkshire, quoting advertisement reference ICI/X/226/e. (T 239p)

CENTRAL ELECTRICITY AUTHORITY invite applications for the appointment of FOURTH ASSISTANT ENGINEER in the Generation Operation Branch of the Chief Engineer's Department, Bankside House, London.

Duties: To assist in the statistical analysis of power station operation results in the Section of the Technical Engineer and Statistician. Candidates should preferably have served a power station apprenticeship and have obtained Higher National Certificate in Mechanical Engineering. Experience in calculations of turbine and boiler test results would be an advantage. Candidates should possess an aptitude for mathematics and should be prepared to study statistical methods of analysis and the use of calculating machinery.

Salary N.J.B. Grade 4, Schedule C, £709/£893 per annum inclusive of London Allowance.

Applications, giving details of age, qualifications, experience and present position and salary, to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 8 July. Please quote ref.: AE/615. (T 367)

CENTRAL ELECTRICITY AUTHORITY invite applications for the appointment of SECOND ASSISTANT ENGINEER in the Transmission Construction (Co-ordination) Sub-branch of the Chief Engineer's Department at Bankside House, London. Candidates should, preferably, have a University Degree or Higher National Certificate in Electrical Engineering, have obtained experience in manufacture and construction of high voltage Transmission equipment and be conversant with the layout of high voltage substations and preparation of enquiries.

Salary N.J.B. Grade 2, Schedule C, £971/£1,325 per annum, including London Allowance, according to qualifications and experience. Applications stating age, qualifications and experience, present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 15 July. Please quote ref.: AE/616. (T 368)

MECHANICAL DESIGNERS AND DETAILED DRAUGHTSMEN

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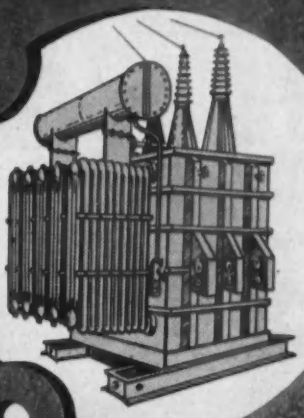

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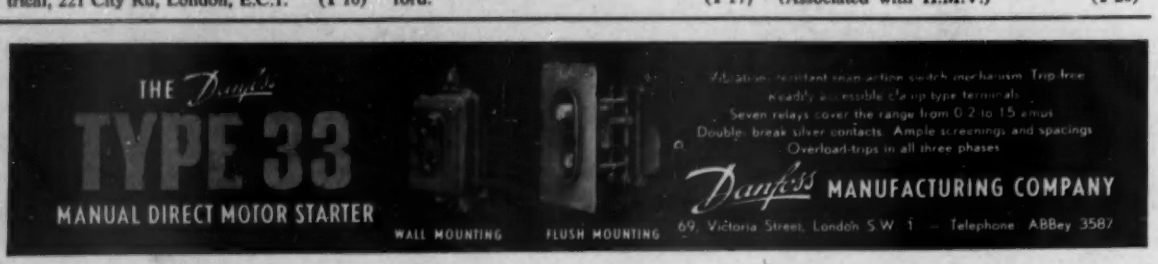
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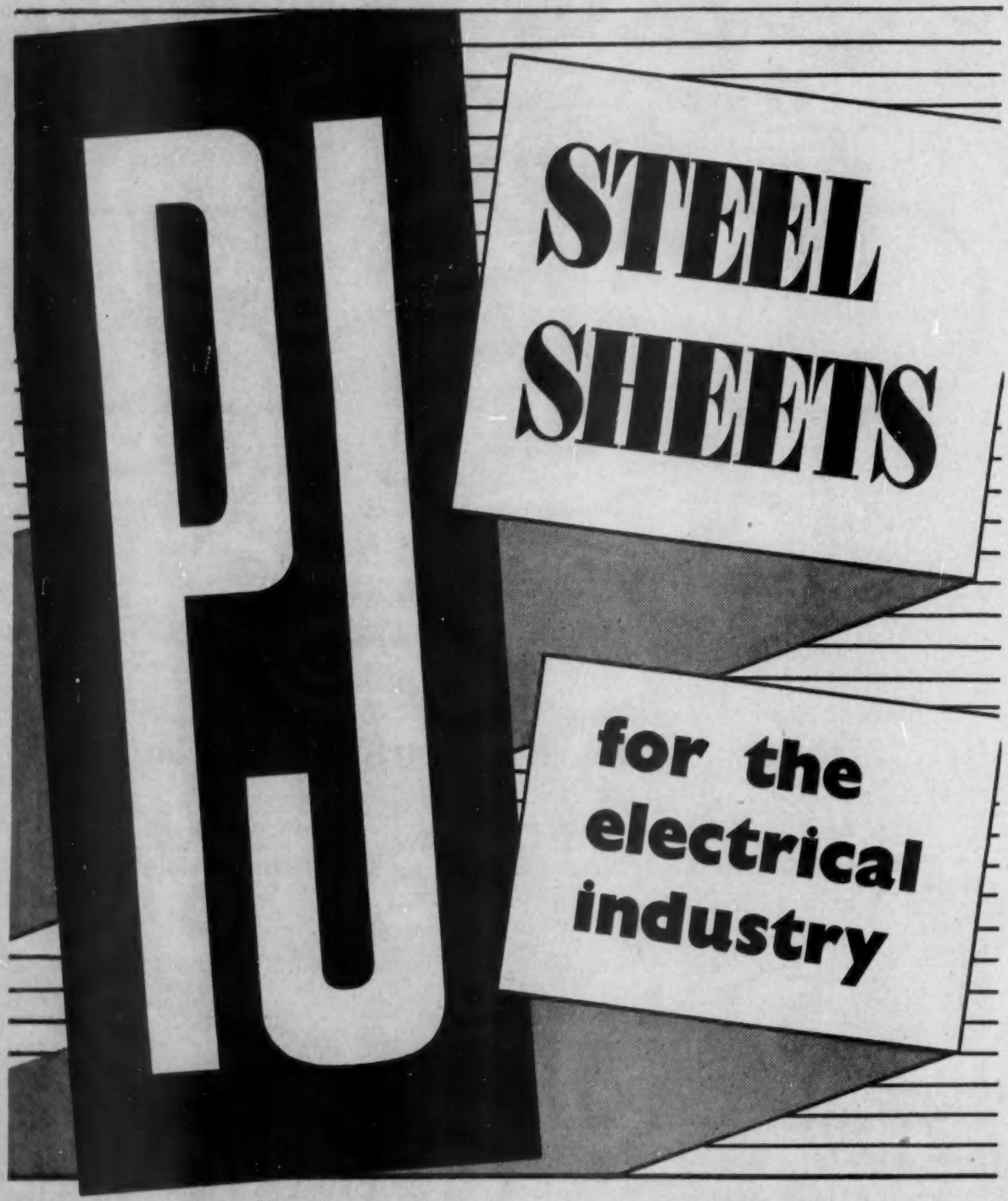

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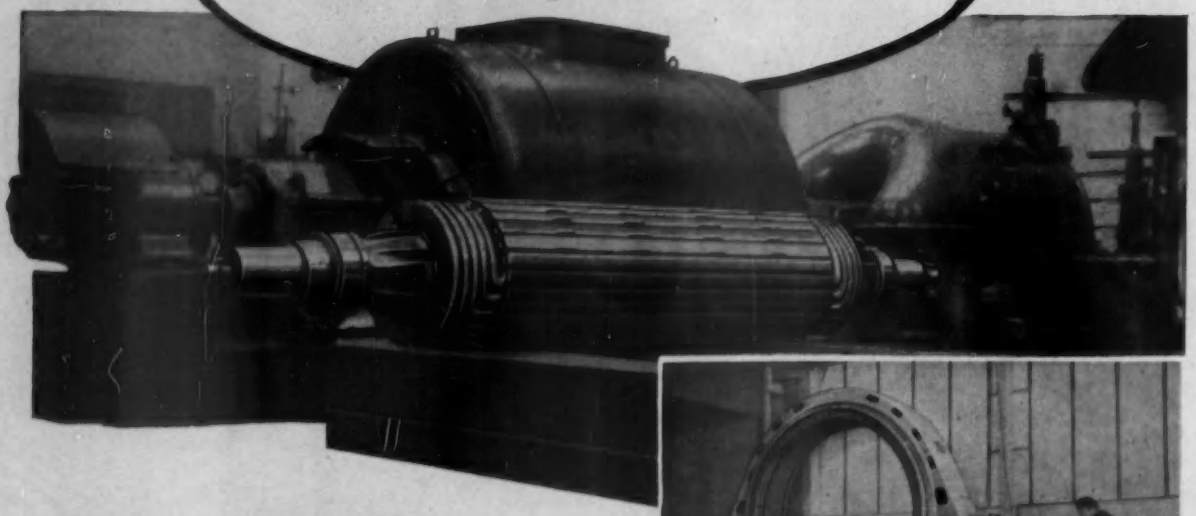

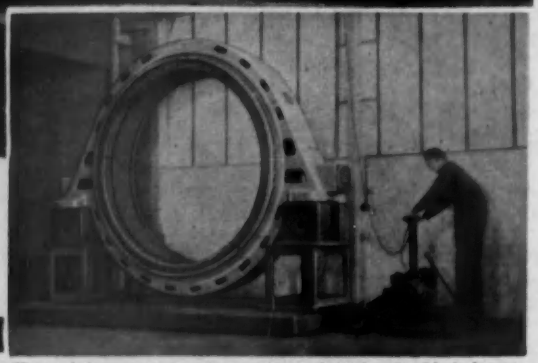

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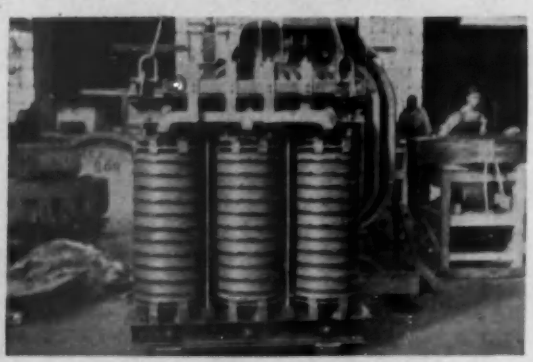
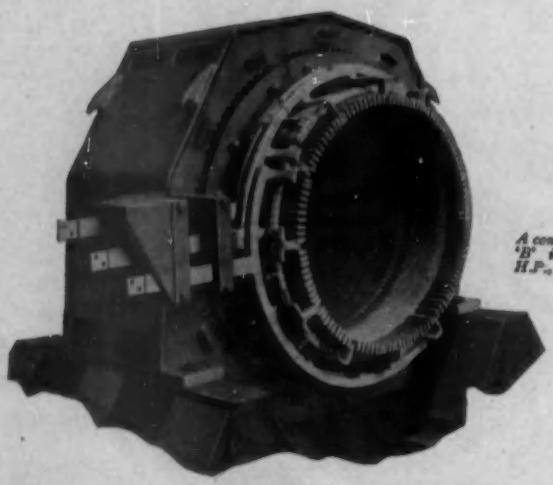


750 kVA Transformer, 20,000/440 volt, 3 ph., 50 cycle. (440 V Secondary rewound.)



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TO B.S. 1833

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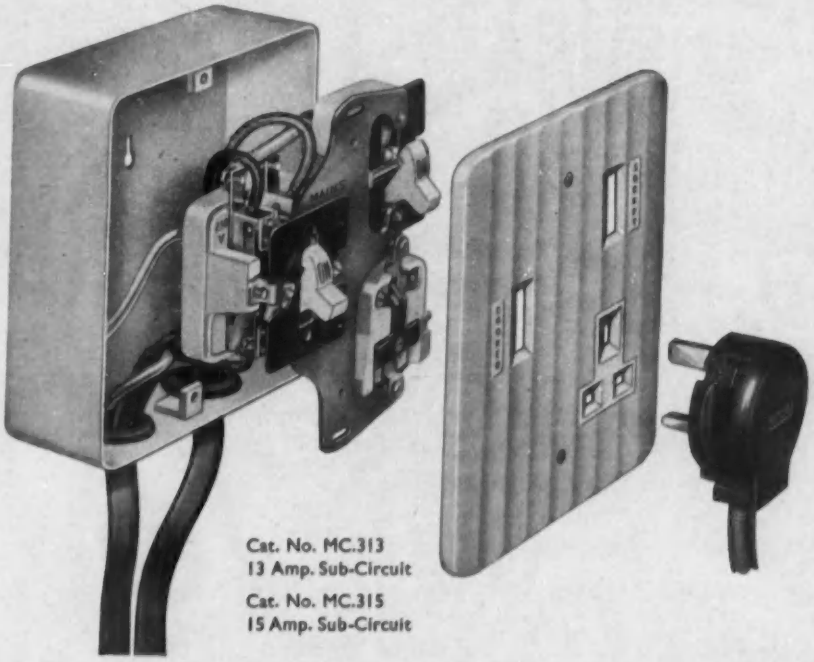

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13 Amp. Sub-Circuit

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Attractively designed moulded covers and steel cases suitable for most decoration schemes. Slow break 30 amp. A.C. main switch movement with silver contacts, and porcelain insulation carrying all "live" metal parts. Sub-circuit arrangements comprise 13 amp. Shuttered socket-outlet with fused plug to B.S. 1363 or 15 amp. Round Pin Socket and Plug to B.S. 546.

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Agriculture and the Balance of Power

BRITISH FARMERS ARE PRODUCING MORE FOOD—more efficiently. They are using less labour—more productively. They are using *more electricity.*

Electricity pumps water, hoists loads, dries crops, helps to light the cowsheds, milk the cows and keep the milk cool and fresh. Electricity is the perfect farm worker, available at any time of the day or night.

The farmer's wife, too, is using more electricity, to give her comforts and convenience never before available in the country. All this is very fine for the farmer and his wife. But how about the other consumers who want electricity? It's a very good thing for them too. Why?

It's a matter of balance. Different jobs need electricity at different times of the day and night. These varied demands help to even out the load on the power stations. When generating plant is continuously operated the price of electricity is kept low. All users benefit, therefore, the more widely electricity is used, for more and more purposes.

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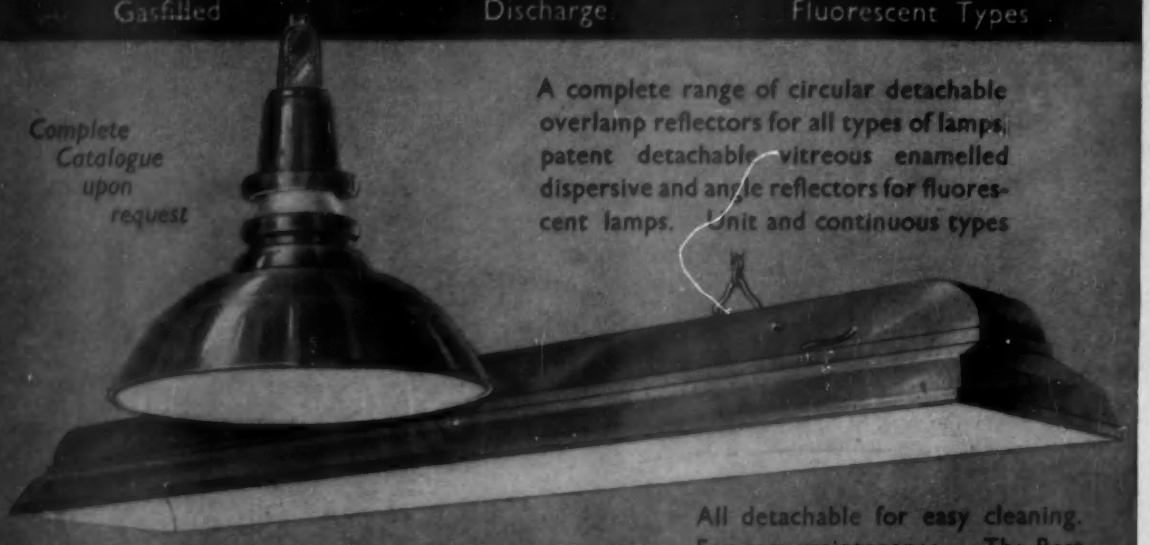

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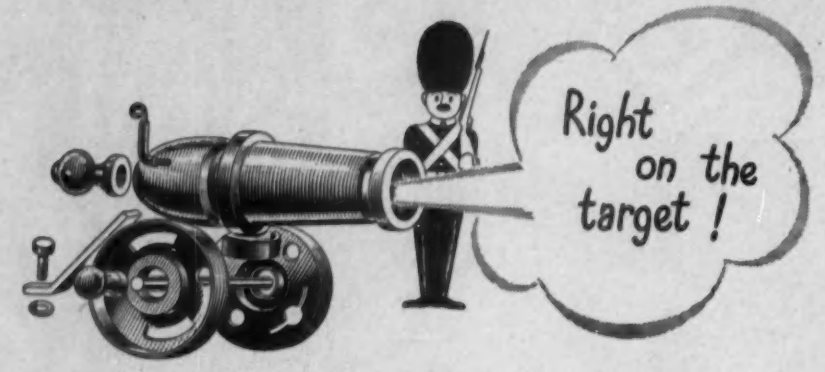

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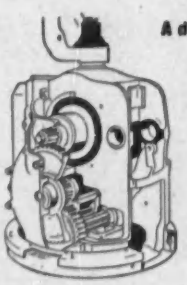
This truck is designed to eliminate breakdowns

Photograph by courtesy of Humber Ltd., Coventry

A load on your "Worksaver" is a load off your mind!

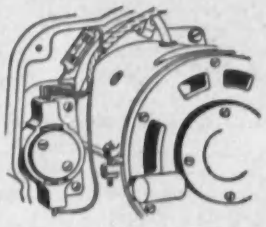
When mechanical handling equipment lies idle—waiting for attention or spares—production costs *shoot* up. Invest in a "Worksaver"; put it to work and compare its trouble-free service with any of your other trucks. Then you'll understand why so many plants—large and small—are changing to Yale.

The "Worksaver" is available in Fork Lift, Pallet, Platform and Tractor models.



A drive unit that lasts a lifetime

This powerful, robust drive unit will stand up to a lifetime of rough handling. Gears are drop-forged nickel-chrome-molybdenum steel, heat-treated and mounted on ball bearings, operating in oil. Entire drive unit is enclosed and floats on 105 ball bearings.



Simple to change brushes

Drive motor of a high torque series wound type, specially designed for easy cleaning and adjustment.

Split hub eliminates pressing in tyres

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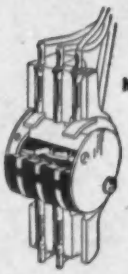

No frayed, broken wires

On the "Worksaver", all flexing, chafing and bending of wires is eliminated. Slip rings are built into the base of the handle so that wiring cannot be twisted or bent, no matter how the handle is turned or lifted.

A capstan built to take the load and more

The load-carrying tapered roller bearing ensures perfect alignment of the unit. The power line is carried through silver contacts. Wires cannot bend whatever the angle of the turn.

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The head and heart of the "Worksaver" is fully protected, yet easily accessible for adjustments and inspection. It can be removed from the truck in five minutes.

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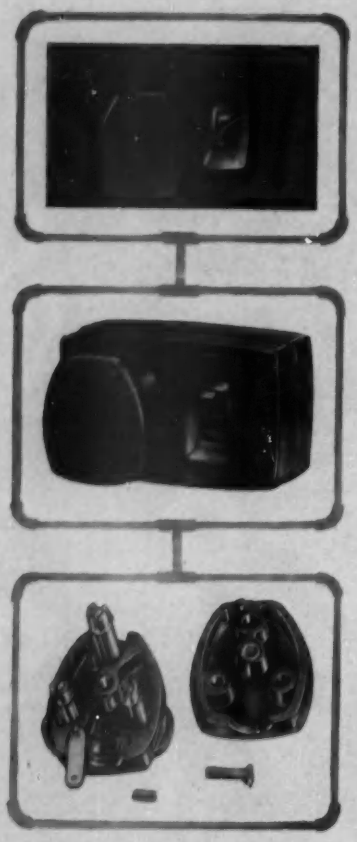

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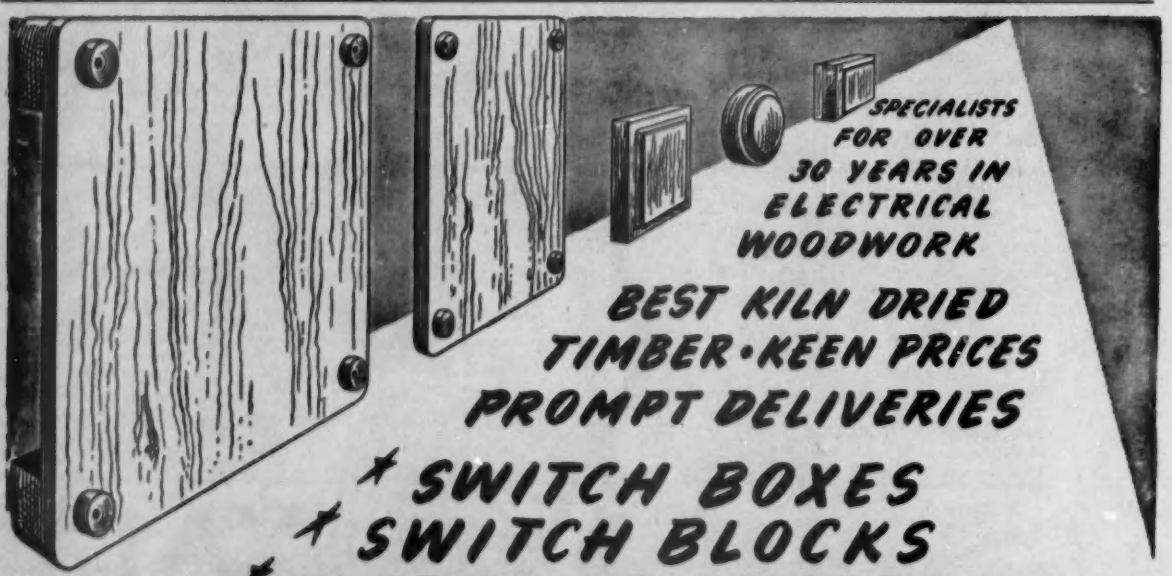

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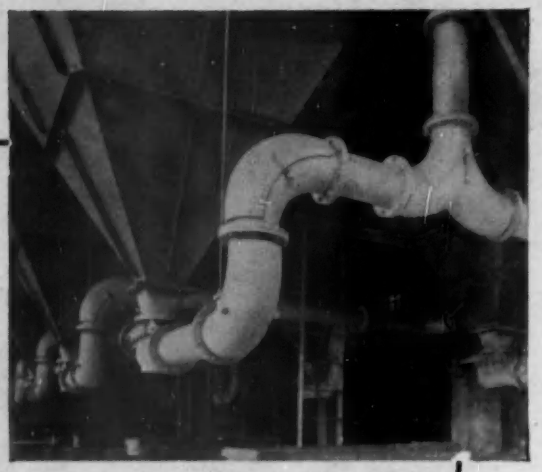

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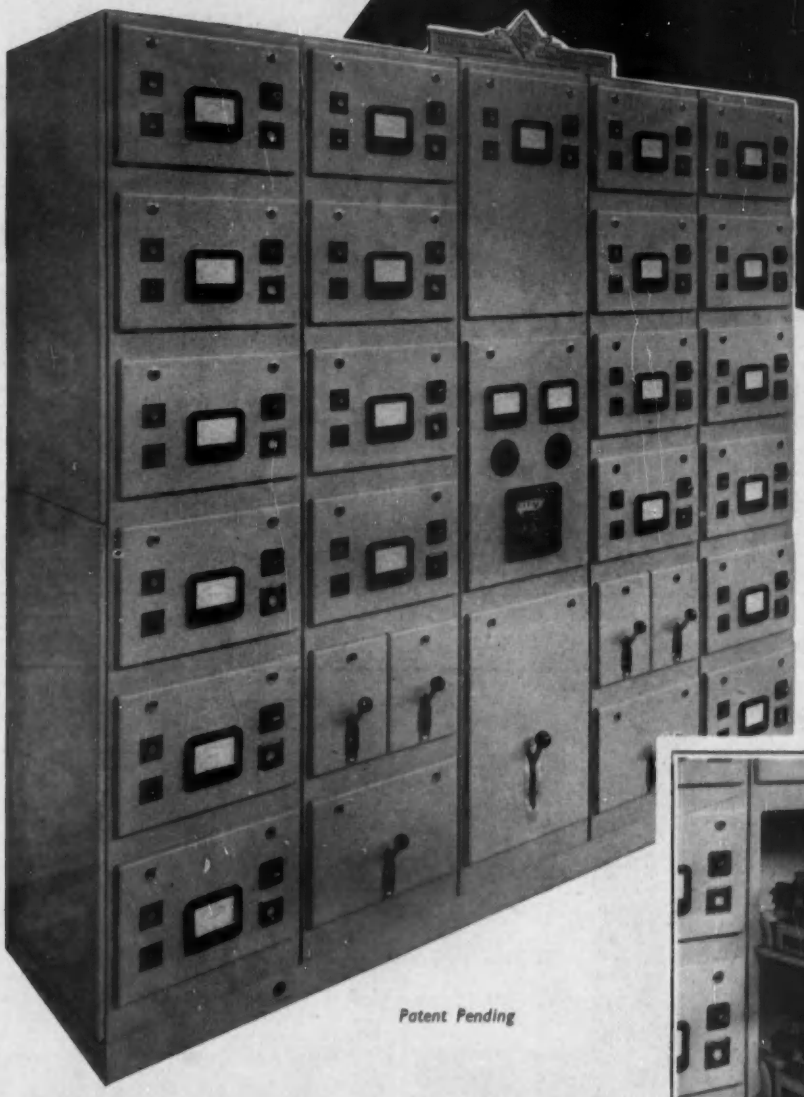

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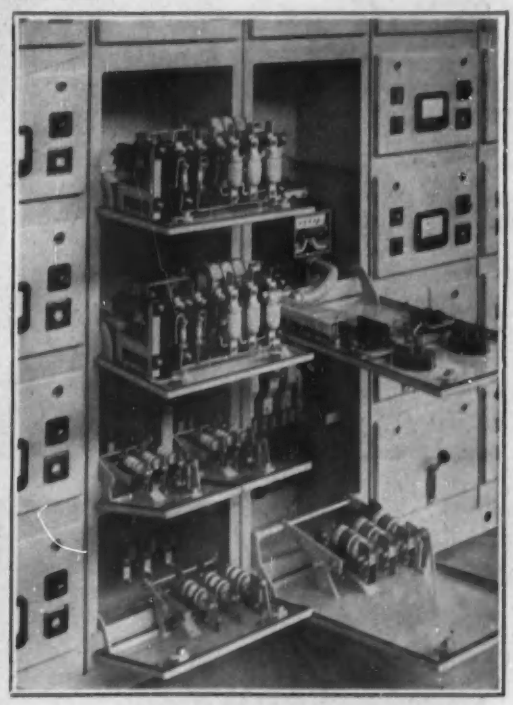

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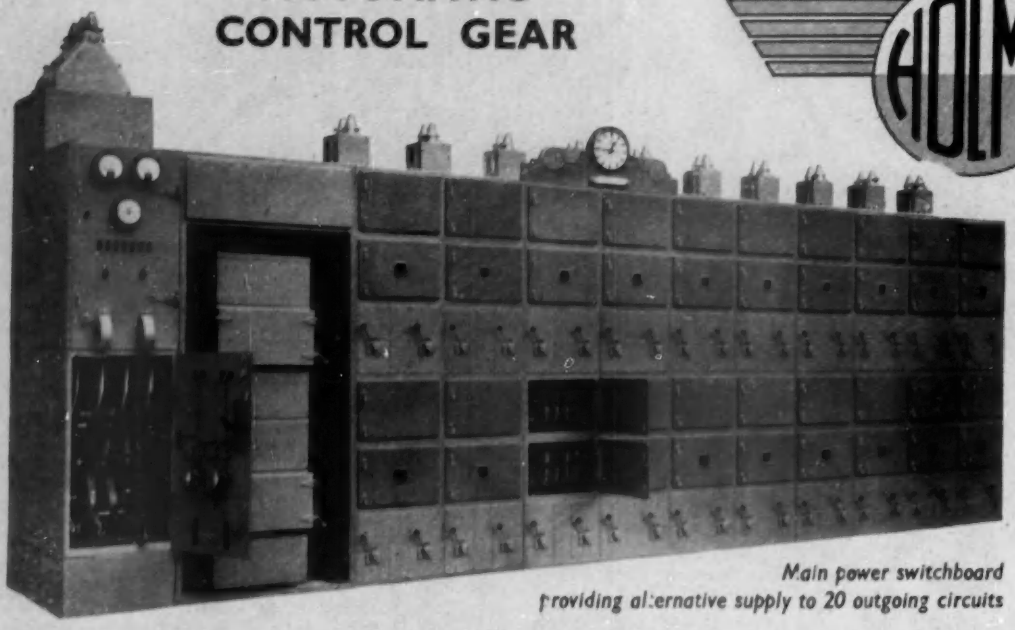

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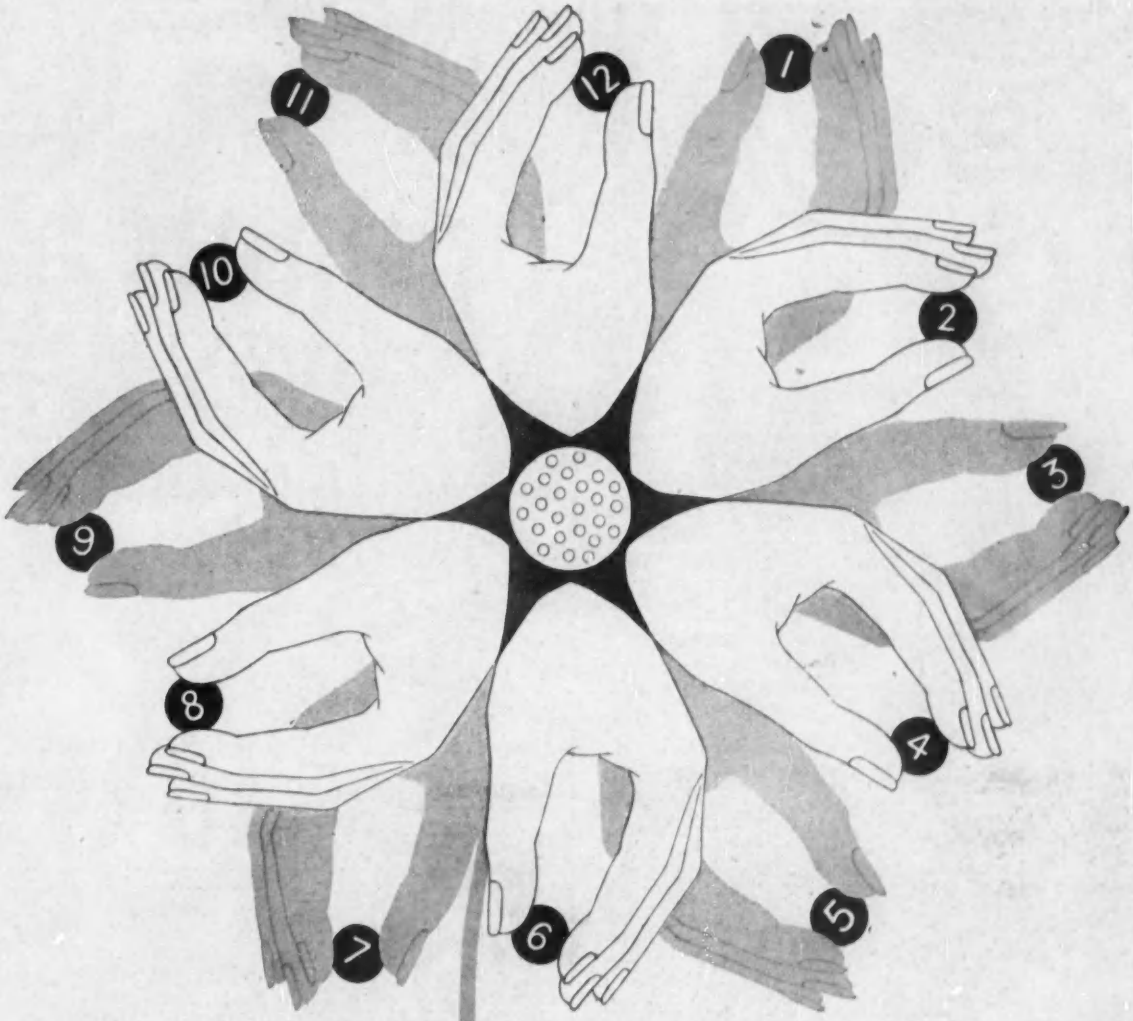

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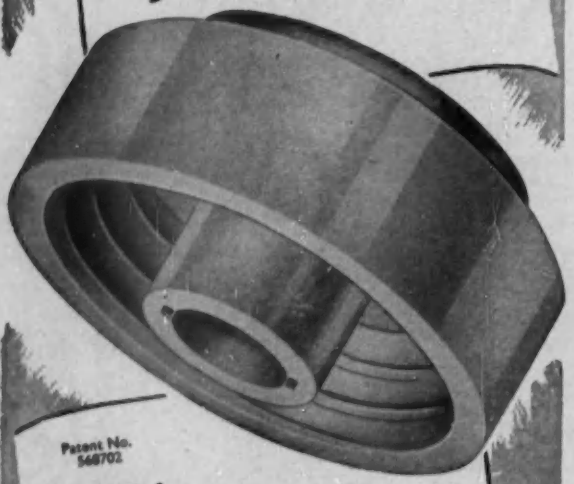

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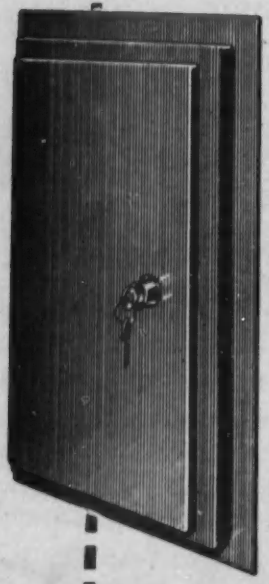

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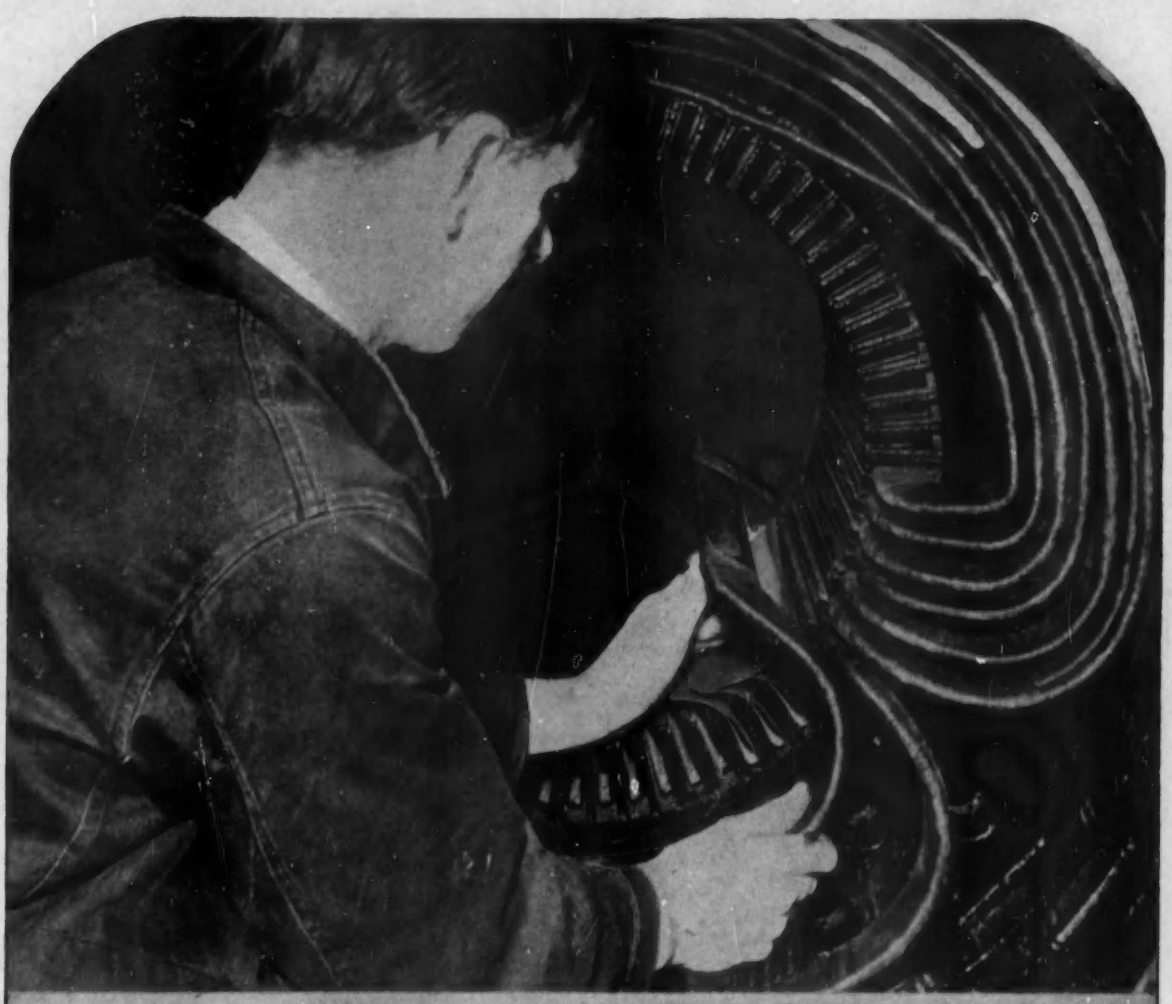

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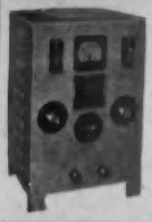

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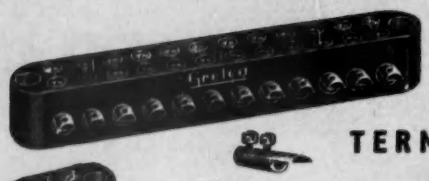

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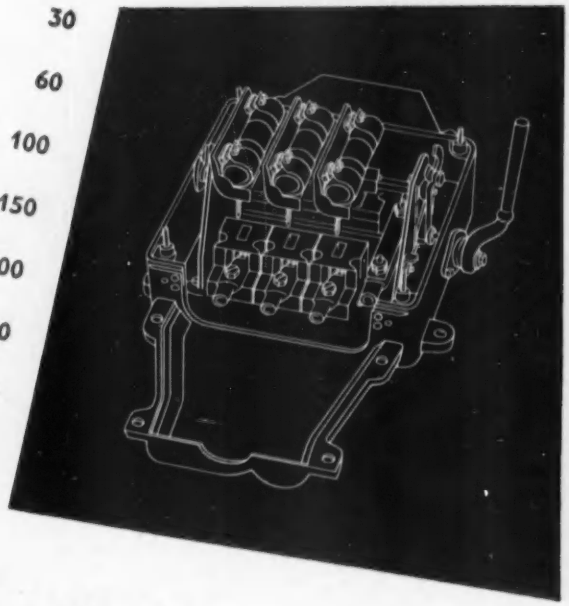

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